



- CITY OF CLOVIS - MEMO TO THE PLANNING COMMISSION

TO: Clovis Planning Commission

FROM: Planning and Development Services

DATE: February 25, 2013

SUBJECT: Hold Public Hearing to Review CUP 2011-05, for The Firing Line, an Indoor Shooting Range Located at 1173 Dayton Avenue; Determine Whether The Firing Line is in Violation of the CUP or Otherwise Operating as a Public Nuisance; and Consider Whether to Modify or Revoke the CUP

Consider Approval of Resolution No. ____, a Resolution of the Planning Commission of the City of Clovis Finding that The Firing Line is in Compliance With the Conditions of Approval for CUP2011-05 and is Not Operating as a Public Nuisance, and Recommending That No Action be Taken

or

Alternative Resolution No. ____, a Resolution of the Planning Commission of the City of Clovis Finding that The Firing Line Has Violated the Conditions of Approval for CUP2011-05 or is Otherwise Operating as a Public Nuisance, and Recommending that the CUP be Modified to include Additional Conditions of Approval

or

Alternative Resolution No. ____, a Resolution of the Planning Commission of the City of Clovis Finding that The Firing Line Has Violated the Conditions of Approval for CUP2011-05 or is Otherwise Operating as a Public Nuisance, that the Violations Cannot be Alleviated, and Recommending Revocation of the CUP

ATTACHMENTS:

- Attachment 1: Map of Neighborhood and Adjoining Industrial Area
- Attachment 2: Zoning and Current Use Map
- Attachment 3: November 21, 2011, CUP2011-05 Council Staff Report
- Attachment 4: Final Resolution and Conditions of Approval, CUP2011-05 (Resolution No. 11-124)
- Attachment 5: Minutes from November 21, 2011 Council Meeting
- Attachment 6: Approved Site Plan and Floor Plan
- Attachment 7: List of Permitted Uses in M-1 Light Manufacturing District
- Attachment 8: Portions of The NRA Range Source Book: Section I Introduction, Chapter 1 General Information, Article 4 Indoor Ranges and Chapter 6 Sound Abatement; Section III, Chapter 1 General Indoor Range Information and Chapter 2 Indoor Range Design Criteria.
- Attachment 9: 2010 Noise Control Engineering Journal 58, Noise Control Solutions for Indoor Firing Ranges, July-August 2010
- Attachment 10: December 12, 2012 NRA Letter to Business Owner
- Attachment 11: Phase 1 Noise Report
- Attachment 12: Phase 2 Noise Report
- Attachment 13: Excerpts from Range Design Criteria, U.S. Department of Energy, Office of Health, Safety and Security
- Attachment 14: Compilation of Articles Identified by the Centers for Disease Control and Prevention, Indoor Firing Ranges
- Attachment 15: Newspaper Articles Regarding Concerns With Noise From Indoor Gun Ranges
- Attachment 16: Troy Acoustics Corporation, A Primer on Indoor Shooting Range Acoustics (2012)
- Attachment 17: Public Hearing Notice
- Attachment 18: Hearing Procedures
- Attachment 19: Draft Resolution "A" Modifying the CUP
- Attachment 20: Draft Alternative Resolution "B" Revoking the CUP
- Attachment 21: Draft Alternative Resolution "C" Making No Changes to the CUP
- Attachment 22: Draft Alternative Resolution "D," Generic Resolution Modifying CUP

CONFLICT OF INTEREST

None

RECOMMENDATION

Staff recommends that the Planning Commission conduct the public hearing to review CUP2011-05, for The Firing Line, an indoor shooting range located at 1173 Dayton Avenue; determine whether the use is in violation of the CUP or otherwise operating as a public nuisance; and consider whether to recommend that the City Council modify or revoke the CUP.

If the Commission finds that The Firing Line is in violation of the CUP or is operating as a public nuisance, staff recommends adding a condition of approval that no impulse noise from firearm use exceed a peak of 55 decibels at the property line, and make a finding that compliance with this condition will be deemed to have alleviated the violation and/or public nuisance from firearm noise emanating from the Range.

A proposed Resolution "A" with findings that The Firing Line has violated the conditions of approval for CUP 2011-05 or is otherwise operating as a public nuisance, and recommending modification of the CUP to include this additional condition of approval is included as Attachment 19.

Should the Commission find that The Firing Line has violated the conditions of approval for CUP 2011-05 or is otherwise operating as a public nuisance, and that the violations cannot be alleviated with modifications of the CUP, an alternative Resolution "B" recommending revocation of the CUP is included as Attachment 20.

Should the Commission find that The Firing Line has not violated the conditions of approval for CUP 2011-05 and is not operating as a public nuisance, a second alternative Resolution "C" finding that The Firing Line is in compliance with the CUP and recommending that no action be taken is included as Attachment 21.

A third alternative generic Resolution "D" with findings and modifying the CUP is included as Attachment 22. This alternative is provided in order to give the Commission the option of adding different conditions of approval depending on the evidence presented during the hearing.

EXECUTIVE SUMMARY

On November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue known as The Firing Line. The Firing Line is located in an industrial area adjacent to a residential neighborhood. Since opening for business in March 2012, neighbors have been complaining about the noise. Their concerns are not so much with the volume of the noise, but the character of the noise.

On February 4, 2013, the City Council directed staff to process a CUP modification/revocation hearing to determine if The Firing Line is in violation of the CUP or is otherwise operating as a nuisance, and if so, to determine what changes can be made to the CUP that would alleviate those violations. The Council directed that the matter first be heard before the Planning Commission with a recommendation to the City Council. The procedures for conducting the hearing, as approved by the Council, are included in Attachment 18.

Staff believes that while the use is not exceeding the General Plan noise standard of 65 CNEL at the property line (CUP Condition No. 6), the business is creating excessive noise in violation of Condition No. 7 and operating contrary to the Council's finding that

the use would have no adverse effect on abutting properties. Staff also believes the business is causing a nuisance based upon comments from the neighbors that the use and enjoyment of their property has been severely impacted by the firearms noise. This is an independent ground to consider modification of the CUP.

If the Commission finds that the use is in violation of the conditions of approval, or otherwise a nuisance, the Commission may recommend amending, or adding to, the conditions of approval to alleviate the violations. The Commission may not recommend revocation unless the Commission determines that the violations cannot be alleviated.

Staff recommends that the Planning Commission find a violation of the conditions of approval or that the use is otherwise operating as a nuisance and add the following condition of approval to the CUP:

No impulse noise from firearm use shall exceed a peak of 55dBA (decibels, A weighted) at the residential property line.

Staff believes that with this condition of approval, firearms use at The Firing Line will emit noise similar to other industrial noises that can reasonably be expected in the neighborhood and therefore the business will no longer be in violation of the CUP or operating as a nuisance.

BACKGROUND

Site History

On November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue. The property is zoned M-1 (light industrial district). Directly to the north is property zoned R-1 (single family residential district). Attachments 1 and 2 include photographs and maps of the area with the zoning designations. The shooting range operates under the name The Firing Line and has been open for business since March, 2012. The location of The Firing Line is shown on Attachment 2.

The industrial designation has been with the property since at least the 1970s, and carries over from a previous County designation. The area to the south is in the City of Fresno and is similarly zoned, with large industrial users, including Duncan Ceramics. The residential tract was previously zoned M-1 light industrial district, with the entire area available for large industrial development. In 1983, the City Council approved a General Plan Amendment (GPA 83-3) setting the stage for the residential tract. The City approved the associated Tract Map 3610 in 1985 and full build out occurred in 1987.

The remaining industrial area within Clovis built out after completion of Tract 3610, from approximately 1990 through 2004. The industrial area within the City of Fresno had

been built out much earlier. With the industrial area being approved long before the residential tract, and with the Fresno portion of the industrial area already built, all residents were on notice that their neighborhood adjoined an industrial area. Uses permitted by right in the M-1 zone district without any further approvals include manufacturing, processing and fabrication uses. A listing of permitted uses is contained in Attachment 7.

Current and past uses in the industrial area include:

1113 Dayton

- Innovative Cements
- Farm Fresh Foods
- Presson Communications
- Heritage Construction
- Eric Sims Maintenance and Air

1173 Dayton

- Unlimited Doors – Matthews Quality Construction
- Willems Kustom Woodworking
- The Firing Line

1263 Dayton

- Renn Custom Car Interiors
- Patterson Paint
- Gary's Classic Truck Stop
- Michael T. Murphy Art Metal Work
- Enterprise Street Rod Consultants

1283 Dayton

- No businesses licensed at this address.

1323 Dayton

- Graham Concrete Construction
- Ostergarrd Towing
- B N B Towing
- Low Cost Towing
- C M Enterprise
- Enterprise Site control – Graham Diversified Ent.
- Triple A Trucking Inc.
- Car Beauty Products

3783 Duke

- Glovefit International
- O'Neal Masonry Partners

Prior to approval of The Firing Line, there were a few complaints from neighbors about the industrial uses, mostly about noise and aesthetics. Those concerns were resolved without the need for any formal action.

CUP2011-05

Shooting ranges are permissible in the M-1 zone district subject to a conditional use permit ("CUP"). (Clovis Municipal Code ("CMC") § 9.3.304B16.) In 2011, Jacob Belemjian, owner of The Firing Line, made application for CUP2011-05. Residential neighbors expressed concern with the proposal, mostly about safety, noise, and traffic. Residents also submitted a petition in opposition to the proposed use, a copy of which was included in the November 21, 2011 Council staff report. (Attachment 3)

In approving CUP2011-05, the Council made a finding that "the proposed use will have no adverse effect on abutting properties and the permitted use thereon." The Council was able to make this finding based upon what was known at the time and with conditions of approval. One of the conditions is that the use not exceed the General Plan noise standard of 65 CNEL measured at the residential property line. (Attachment 4.)

This condition was based upon the assumption that impulse firearm noise would be similar to other industrial noises and therefore should be treated the same. The Council also believed, based upon representations from the owner, that The Firing Line would satisfy the National Rifle Association ("NRA") Guidelines for shooting ranges, as reflected in the NRA Range Source Book. (Attachment 8) In its November 21, 2011 report, staff also referenced a 2010 Noise Control Engineering Journal article, recognizing that article as a good source for determining appropriate sound mitigation measures that the business owner might undertake. (Attachment 9)

The Council approved the following relevant conditions of approval for CUP2011-05 (Attachment 4.):

Condition 2: Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. Monday through Friday, and 9:00 a.m. to 8:00 p.m. on Saturday and Sunday. (As amended during Council meeting)

Condition 6: Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses.

Condition 7: Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit.

Condition 11: The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high

concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap. (As added during Council meeting.)

Noise Complaints

Shortly after opening for business in March 2012, the City received a number of noise complaints about The Firing Line. Staff held meetings with the neighbors and the business owner. Neighbors have been regularly appearing at Council meetings and commenting under public comment. The owner made improvements to the business, but the effectiveness of those measures has not been quantified. The neighbors have noticed no significant difference and they continue to express concerns.

Staff retained a noise consultant to complete a noise study to determine if the Range was exceeding the City's General Plan noise standard of 65 CNEL at the residential property line. In a report dated December 10, 2012 ("Phase 1 Noise Report") (Attachment 11), Brown-Buntin Associates ("Consultant") determined that the Range was not exceeding this standard.

The neighbor's concern is not so much with the volume of noise as it is with the type and character of the noise. Firearms emit an impulsive type of noise with unique sound patterns and frequencies that travel into the residential neighborhood. In a follow up January 24, 2013 report ("Phase 2 Noise Report") (Attachment 12) prepared by the Consultant to assess what measures can be made to the building to further reduce firearm noise emanating from The Firing Line, the Consultant determined that firearm noise from the range, while at or below the 65dBA level at the property line, was the same level in the neighborhood. Further, the Consultant noted that "the CNEL is not effective for assessing noise compatibility around more intermittent sources of noise such as a firing line." (Phase 2 Noise Report, p. 3.)

The firearm noise, at the 65 dBA level is disturbing the neighbor's peace and enjoyment of their property. These concerns have been expressed to the Council during many public comment sessions. Additionally, in follow up to the neighbors' complaints before the Council, the City attorney's office made attempts to meet with all of the neighbors, both residential and commercial, to assess the level of concern within the entire neighborhood. While not everyone who met with the City Attorney's office expressed a concern with The Firing Line, the large majority had concerns with operation of the Firing Line.

Concerns include:

- Children are scared and will not go outside to play.
- Unable to distinguish between range gunfire and other gunfire.
- Unable to sleep during the day.
- Constant gun-fire seven days a week, so never have any peace and quiet.
- Have to keep windows closed.

- Difficulty sleeping and studying.
- Moved to Clovis to be away from gun-fire previously heard in prior neighborhood.
- Property values are lower.
- Children will become desensitized to gunfire.
- Can't enjoy backyard.
- Dogs are scared, agitated.
- Dogs won't go outside.
- Dogs bark and cause chain reaction in the neighborhood.
- Had to get rid of dogs.
- Windows rattle.
- Headaches.
- Affects post-traumatic stress syndrome.
- Mental degradation.
- Anxiety.
- Depression.
- High blood pressure.
- Increased stress.

The noise has been characterized as:

- Constant popping and occasional boom.
- Sharp, loud distinctive noise, not like a hammer.
- Very defined noise travels through walls.
- Sounds like a small cannon.
- Scary and loud.
- Very disturbing.
- Loud and annoying.
- Barely noticeable to extremely loud.
- Small caliber noise is acceptable but large caliber noise is very loud.
- Gun noise continues after other businesses close.
- Explosive concussion sound.
- More frequent than other industrial noises.
- Consistent noise.

Those most impacted appear to live within the first four rows of homes behind The Firing Line and along Eddy, but many others in the neighborhood expressed a concern as well. Neighbors were invited to attend the Planning Commission meeting to show where they live and articulate their concerns.

The uniqueness of firearm noise is evidenced by the need for special regulations to address the occupational health hazard associated with firearm use. (See for example compilation of articles identified by the Centers for Disease Control and Prevention, Indoor Firing Ranges, www.cdc.gov/niosh/topics/ranges, Attachment 14; see also Range Design Criteria, U.S. Department of Energy, Office of Health, Safety and Security, Attachment 13.)

The Noise Control Engineering Journal article, cited in the November 21, 2011 Staff report (Attachment 9), contains an excellent discussion of the concerns from impulsive noise from firearms and explores ways to reduce the transmission of airborne and structural-borne sounds to adjacent areas and facilities.

A number of acoustical companies, recognizing the uniqueness of impulse firearm noise, have studied firearm noise and developed measures to assist with mitigating noise impacts from indoor shooting ranges. (See, in particular, Troy Acoustics Corporation, A Primer on Indoor Shooting Range Acoustics (2012), Attachment 16.)

Concerns about firearm use from shooting ranges disturbing neighbors is not unique to this situation. Staff obtained a number of recent articles nationwide discussing this issue, which are included in Attachment 15.

The following are excerpts from the articles relating to indoor gun ranges:

January 17, 2012, Baxter/Brainerd Minnesota, "Shooting Range Approved:"

- Gunshots would be hard to hear
- The facility would be air tight, and if someone did not follow proper protocol, that a noise, sounding like a car door shutting, could be heard.

September 11, 2012, East Brunswick New Jersey, "Variance For Indoor Shooting Range:"

- "It is located in an area ideally suited for it," he said, noting the lack of neighboring residences.

September 26, 2012 Federal Way Washington, "Indoor Shooting Range Opens for Business:"

- The gunfire is barely audible outside the building, where a massive ventilation system takes up an entire outside wall.

April 23, 2012, Lewisville Texas, Lewisville Indoor Gun Range

- The only significant concern the police department had was in regards to potential noise complaints.
- "Our concern for an indoor gun range is about any noise that may come from within the structure."
- "The proposed location is within a mile of residential homes but is surrounded by buildings and a raised railroad trestle, so it is our belief that any sound carrying from the structure is minimized and not likely to result in complaints."

November 22, 2012, South Jordan Utah, "Over Resident Objections South Jordan Oks Indoor Gun Range:"

- After battling two appeals from nearby homeowners, gun enthusiasts gained approval this week from the City Council to build a large indoor shooting range less than 150 feet from a neighborhood where close to three dozen children live and play.
- Maynard believes that this will be the quietest gun range in the western United States. He said his people have built a "box within a box" – the gun range is basically a separate building inside the main building.

Even if firearm noise emanating from The Firing Line does not exceed the 65 CNEL and 65dBA at the nearest residential property line, the noise could still be considered a nuisance to the neighbors. CMC, section 5.8.15 "Disturbing the Peace" provides as follows:

(a) No person shall make, or cause or suffer or permit to be made or caused, upon any premises owned, occupied, or controlled by him or upon any public street, alley, or thoroughfare any unnecessary noise or sound by means of the human voice or by any other means or methods which are physically annoying to persons, or which are so harsh or so prolonged or unnatural or unusual in their use, time, and place as to occasion physical discomfort, or which are injurious to the lives, health, peace, and comfort of the inhabitants of the City, or any number thereof.

Additionally, any violation of the Municipal Code is deemed a public nuisance. (CMC § 1.2.01(e).)

Further, California Civil Code section 3480 defines a public nuisance as "one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal." All other nuisances are private nuisances. (Civil Code § 3481. A nuisance under the Civil Code means:

Anything which is injurious to health, including, but not limited to, the illegal sale of controlled substances, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property, or unlawfully obstructs the free passage or use, in the customary manner, of any navigable lake, or river, bay, stream, canal, or basin, or any public park, square, street, or highway, is a nuisance.

If The Firing Line is operating as a nuisance, this would be an independent ground to modify or revoke the CUP.

PROPOSAL AND ANALYSIS

Authority to Modify or Revoke a CUP

Conditional use permits confer a fundamental property right upon the owner to operate in accordance with the permit. Once issued and after substantial investment is made in reliance upon the issuance, a CUP may only be modified or revoked if: (1) one or more of the conditions of approval are violated; or (2) the permittee conducts the permitted activity in such a manner as to create a public nuisance. Generally, if modifications to a CUP can alleviate the government's concerns, the permit should be modified instead of revoked. (*O'Hagen v. Board of Zoning Adjustment* (1971) 19 Cal.App.3d 151; *Trans-Oceanic Oil Corp. v. Santa Barbara* (1948) 85 Cal.App.2d 776). A federal court had occasion to apply these principles in a case involving an indoor shooting range. (*Hartland Sportsman's Club v. Town of Delafield* (1993) 827. F. Supp. 562.)

Were the Conditions of Approval Violated or is The Firing Line Operating as a Nuisance

The issue before the Commission is whether The Firing Line has violated its conditions of approval or is otherwise operating as a nuisance. Staff believes, based upon concerns presented by the neighbors, which will be presented to the Commission during the hearing, that The Firing Line has both violated the conditions of approval and is operating as a public nuisance.

CUP Condition No. 7 Excessive Noise and Finding of No Adverse Effect

Condition No. 7 states that "Excessive" noise is a ground to revoke the CUP. Even though the gun noise from the range does not exceed the City's General Plan 65CNEL noise standard, staff believes that the noise is excessive because of the nature of the noise and the problems it has caused for the neighbors, as noted above.

In addition to Condition No. 7, the City Council approved the CUP based upon the finding that the "use will have no adverse effect on abutting properties and the permitted use thereon." The Council made this finding based upon the assumption that the conditions of approval would address any concerns of the neighbors. Once the business opened for business, this assumption turned out to be false. The business is having an adverse effect upon the neighbors.

CUP Condition No. 11 Compliance With NRA Range Source Book

The owner of The Firing Line represented to the City that he would be using the NRA Range Source Book as a guide to plan and construct the shooting range. According to the November 21, 2011, City Council staff report for approval of the CUP (Attachment 3):

The applicant has advised staff that he is using the NRA Range Sourcebook as a guide to plan and construct the proposed shooting range. This document "provides both basic and advanced guidance to assist in the planning, design, construction and maintenance of shooting facilities." The applicant has also completed the NRA's Range Development Course and is consulting a Range Technical Team Advisor for the NRA.

Because of these representations, the City Council added Condition No. 11 to the CUP that the "firing range shall be constructed per the National Rifle Association (NRA) Range Source book."

Staff reviewed relevant portions of the NRA Range Source Book ("NRA Guide") (Attachment 8.) The NRA Guide does not contain specific requirements for addressing noise from indoor shooting ranges except for the following text:

Section III Indoor Ranges, Chapter 2 Design Criteria

3.10 Sound Control

3.10.1 Sound control on indoor ranges includes two distinct components, sound levels within the range, and sound levels in adjoining, occupied rooms. To minimize amplification of sound within the range by reflection, apply acoustical material to walls and ceiling. To reduce transmission of sound to adjoining rooms, seal air leaks with air-tight insulation around doors, windows, ceiling, and walls, and line ventilation and heating ducts with acoustical material.

Most of the NRA Guide, as it relates to noise, focuses more on planning and addressing neighborhood concerns. These are contained in a Chapter on Sound Abatement (Section I, Chapter 6), which is geared primarily for outdoor ranges but has relevance to indoor ranges. The following are key excerpts from the Sound Abatement Chapter:

3.01.1.4: It is important that the master plan include a sound mitigation program.

3.02.1.1 (1) Any sound abatement program must meet the standards of existing regulations, ordinances or laws. In most instances existing laws will specify a sound level for a particular use. ...

(2) A complete description of the proposed site and surrounding areas including site maps to aid in determining if the land use is compatible with current and projected land uses around the proposed site. In addition, it is advisable to conduct an environmental analysis, a part of which would be the development of a "noise profile" as discussed in this chapter. ...

(3) ... Have consultant draw a "noise" profile overlay and include it in the sound abatement program. ...

(6) A sound survey of the area. This will provide information on which future plans will hinge. It will also provide a vehicle whereby public input can be obtained towards the construction of a project. ... Where the results of these

surveys show significant public opposition may exist, the master plan must include sound abatement strategies what will answer opposing arguments.

3.03.1.1 ... Should a noise complaint arise as a result of range operations and the proper approvals have been received, the noise problem is no longer a problem the range facility must face alone. The community must also become involved and assist in resolving the conflict. ...

- 3.03.5 The Community and its Role
- a. Develop a noise control program and goals.
 - b. Develop details of an acoustical survey, before, during and after.
 - c. Develop details of an attitudinal survey.
 - d. Gather existing complaint data.
 - e. Present the program design, and its implementation costs.
 - f. Make noise measurements. ...

There are three sources for solutions to a noise problem. (1) What the range can do to abate sound levels over what existing laws allow, (2) measures available to the complainant, and (3) the role of the community in the matter. ...

As evidenced from these excerpts, the gist of the NRA Guide is to be a good neighbor and have no significant impacts on area residents, especially where the shooting range comes after other uses. The business owner opened The Firing Line fully aware of the NRA Guide and the need to address noise complaints that may arise from the neighborhood. In fact, neighbors expressed concern through public comment and the submission of a petition during the November 21, 2011 Council meeting. (Attachment 3.) The Council believed that the 65 decibel noise standard would alleviate noise complaints. This has not happened and the owner has not taken steps to significantly reduce the sound level emanating from his business.

The owner's only evidence of compliance with the NRA Guide is a letter the owner provided from the NRA dated December 12, 2012. (Attachment 10.) That letter simply states that the NRA Guide is not a substitute for a thorough, professional evaluation of the range. The letter also states that the NRA does not certify or approve ranges or range designs.

For the reasons set forth herein, staff believes that the owner is in violation of Condition No. 11 until he takes additional steps to address the noise complaints

Public Nuisance

The City has a noise nuisance standard within its disturbing the peace ordinance. CMC section 5.8.15 prohibits any person from making noise which is "physically annoying to persons, or which are so harsh or so prolonged or unnatural or unusual in their use, time, and place as to occasion physical discomfort, or which are injurious to the lives,

health, peace, and comfort of the inhabitants of the City, or any number thereof." Any violation of the Municipal Code is also deemed a public nuisance. (CMC § 1.2.01(e).)

Additionally, California Civil Code section 3480 defines a public nuisance as "one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal." A nuisance means: anything "which is injurious to health" or "is indecent or offensive to the senses" so "as to interfere with the comfortable enjoyment of life or property".

The families north of The Firing Line have had their health and well-being adversely impacted by The Firing Range as well as the use and enjoyment of their property. The neighbors will present testimony of these effects, as noted above. This constitutes a nuisance and is grounds for requiring modification of the CUP to alleviate the nuisance.

Remedies

Planning Commission Options

If after the conclusion of the public hearing the Commission finds that, based upon all of the evidence and testimony presented, The Firing Line is in violation of its conditions of approval or is otherwise operating as a nuisance, the Commission may recommend that the City Council modify the CUP to add additional conditions of approval that would ensure no further violations of the CUP and that the business is not operating as a nuisance. If there are no feasible mitigation measures, the Commission may recommend that the City Council revoke the CUP.

A number of options for amending the CUP and adding conditions of approval are available to the Planning Commission. These include the following:

1. Add a condition of approval that no impulse noise from firearm use exceed a peak of 55 decibels at the residential property line, and make a finding that compliance with this condition will be deemed to have alleviated the violation and/or public nuisance from firearm noise emanating from The Firing Line. (Recommended Option).
2. Add a condition of approval that no impulse noise from firearm use exceed a lower or higher peak decibel threshold at the residential property line, to be determined from evidence presented during the public hearing or to be identified in a further study of what that threshold might be, and make a finding that compliance with this condition will be deemed to have alleviated the violation and/or public nuisance from firearm noise emanating from The Firing Line.
3. Add conditions of approval limiting the days and hours of operation for firearm use, and make a finding that compliance with these conditions will be deemed to

have alleviated the violation and/or public nuisance from firearm noise emanating from The Firing Line.

4. Continue action on the CUP modification/revocation in order to allow the owner the opportunity to install additional mitigation measures identified in the Phase 2 Noise Report or other studies performed by the owner, and to evaluate the effectiveness of those measures.
5. Consider alternative proposals offered by the owner, neighbors or Planning Commission.

Staff Recommendation

Staff recommends that the Commission add a condition of approval that no impulse firearm noise from The Firing Line exceed a peak of 55dBA (not the CNEL weighted average) at the residential property line. Staff bases this recommendation after reviewing the Phase 2 Noise Report, personal observations of the varying types of caliber of bullets used at The Firing Line, and comments from the neighbors. The exact proposed language is as follows:

No impulse noise from firearm use shall exceed a peak of 55dBA (decibels, A weighted) at the residential property line.

On January 25, 2013, staff visited The Firing Line and the neighborhood. A staff member shot three types of calibers at the range: .22 caliber, 9mm, and .357 magnum. Based upon discussions with the business owner and staff knowledge of firearms and ammunition, the sound from the .357 is expected to be the loudest gun noise that will come from the range and the .22 is the least.

Additional staff stood in the neighborhood near the intersection of Fedora and Eddy while these firearms were fired. No one else was shooting at the range at the time. There is a significant difference between all three calibers. The .357 emits a distinctive firearm noise equating with a "cannon". The .22, on the other hand, was very similar to a hammer strike. The noise consultant measured the decibel levels difference between the .357 and .22. The .357 emits a 65 dBA noise in the neighborhood at this intersection. The .22 emits a 55 dBA noise. (Phase 2 Noise Report, p. 3.)

It is staff's opinion that firearm noise at 55 dBA (based upon the firing of a .22 caliber pistol), is similar to ordinary industrial noise that could be expected to come from the industrial area south of the neighborhood. Therefore, staff believes that compliance with a condition of approval prohibiting impulse firearm noise in excess of a peak of 55dBA at the residential property line will prevent the business from operating as a nuisance. The conclusion is supported by some of the neighbors who stated that lower caliber firearms were not a concern.

Staff contracted with Maximus Media, an expert in recording sound, in an attempt to record and recreate in the Council Chambers what the noise from the range currently sounds like in the neighborhood, including gun shots at 65 dBA, and what that noise would sound like at 55dBA or other sound levels. If successful, those results will be presented to the Planning Commission. For the recommended condition to be effective, the analysis will need to demonstrate that the sound of a .22 and a .357 magnum at the same dBA level are similar, or otherwise that the .357 magnum at a 55 dBA level is similar to other industrial noise that can be expected in the neighborhood.

Planning Commissioners are encouraged to visit the neighborhood when The Firing Line is open to hear the noise for themselves. To avoid Brown Act violations and due process concerns, Commissioners must visit the neighborhood individually, not share their observations with any other Commissioner, and must identify that they went out to the neighborhood, and when, during the public hearing.

Time To Comply

Staff recommends that the business owner be provided with a reasonable opportunity to satisfy any newly imposed conditions of approval.

NOTICE

The City published notice of this public hearing in the Fresno Bee and mailed copies to the entire neighborhood, including all physical addresses if they were different from the property owner address. This way any renters would have received notice. The City is also mailing notice to all property owners within 600 feet of the business per City custom and the Government Code.

A copy of the Public Hearing Notice is included as Attachment 17.

FISCAL IMPACT

None

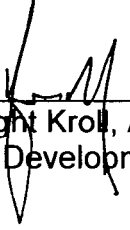
REASONS FOR RECOMMENDATION

It is appropriate to review CUP2011-05 based upon complaints from the neighbors of excessive noise coming from The Firing Line and to determine whether the owner is in compliance with the CUP. It is also appropriate to make a determination whether the conditions of approval should be modified to alleviate the neighbors concerns.

ACTIONS FOLLOWING APPROVAL

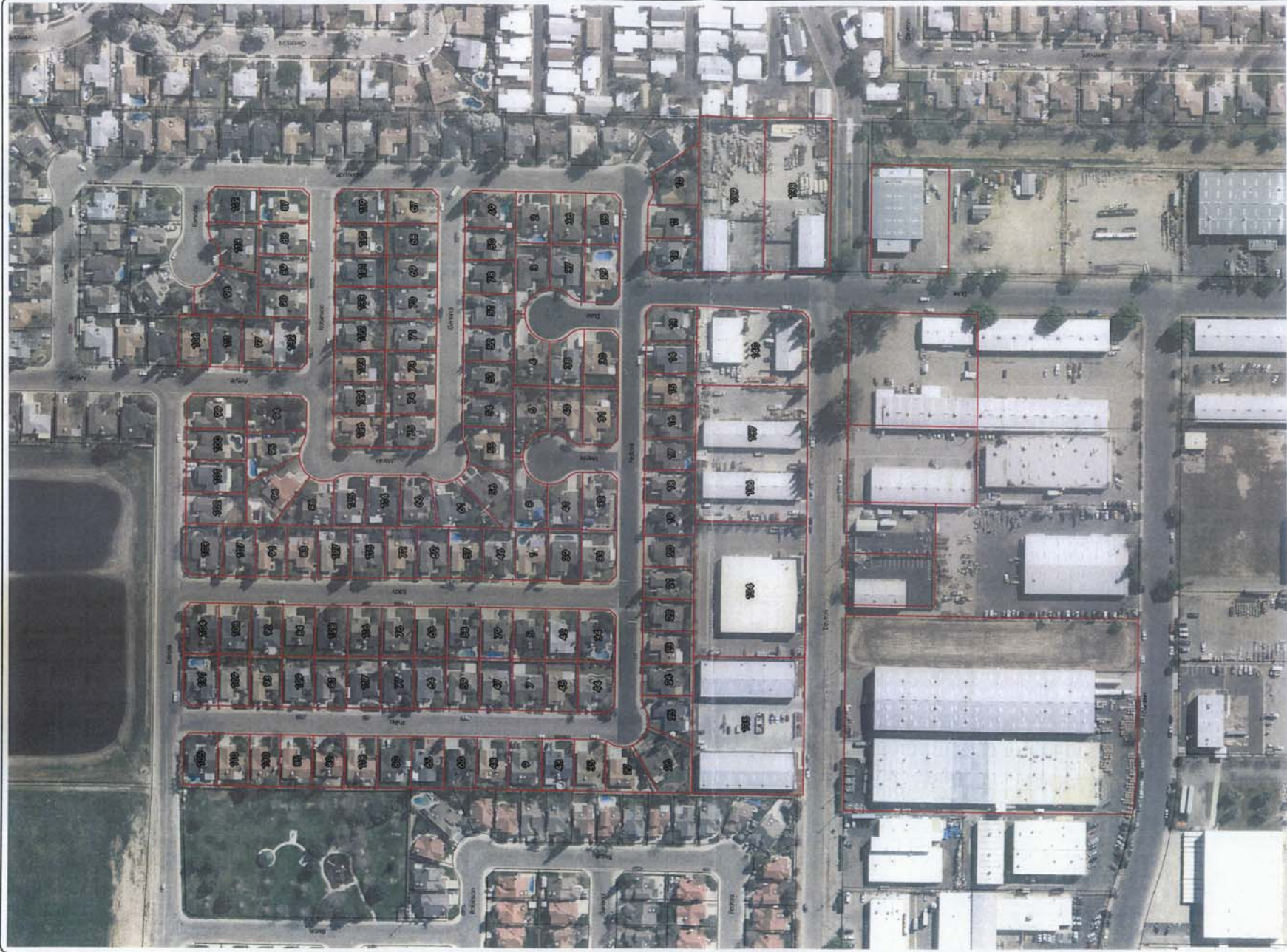
The Planning Commission's recommendation will be forwarded to the Council for approval. If the Planning Commission makes a final decision on February 25, 2013, the Council will hear this matter on March 18, 2013.

Prepared by: David E. Fey, AICP, Deputy City Planner
David Wolfe, City Attorney

Reviewed by: 
Dwight Kroll, AICP, Director of Planning
and Development Services

J:\Planning Projects\CUP\CUP 2011\CUP2011-05 (Pistol Range)\Documents\PC Staff Report CUP2011-05 20130225 doc

ATTACHMENT 1



1/28/2013

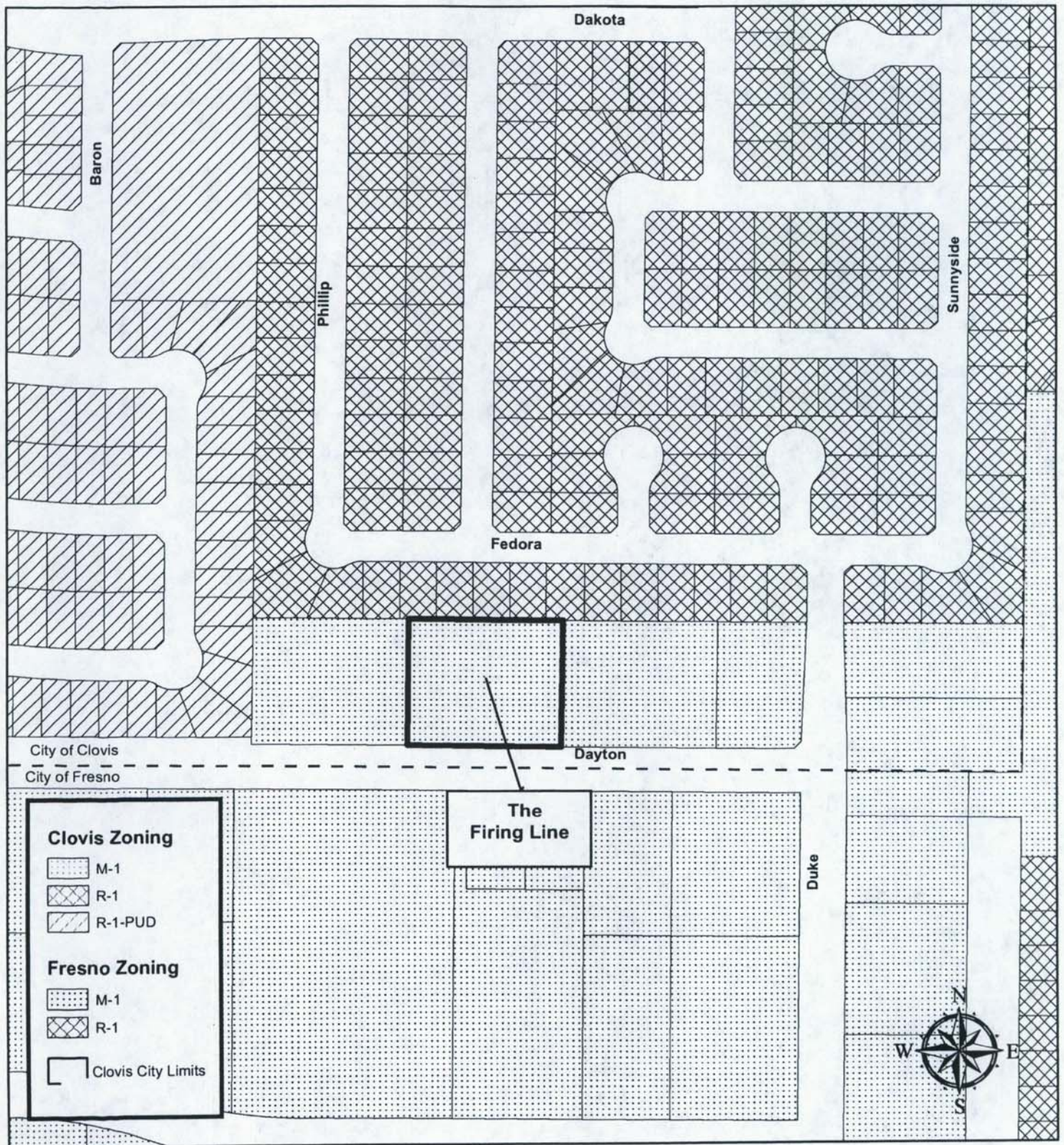
The Firing Line Gun Range Neighborhood Area



1" = 80'

ATTACHMENT 2

CUP 2011-05 Zoning Map



ATTACHMENT 3



AGENDA ITEM NO: 1-A

City Manager: *[Signature]*

- CITY OF CLOVIS - REPORT TO THE CITY COUNCIL

TO: Mayor and City Council

FROM: Planning and Development Services

DATE: November 21, 2011

SUBJECT: Consider Approval – Res. 11-____, CUP2011-05, A request to approve a firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue. Matthew and Janet Gross, owners; Jacob Belemjian, applicant.

ATTACHMENTS:

Figure 1:	Location Map
Exhibit "A.:"	Conditions of Approval
Attachment 1:	Planning Commission Minutes
Attachment 2:	Draft Resolution
Attachment 3:	Petition from Neighbors in Opposition
Exhibit "B.:"	Site Plan
Exhibit "C.:"	Floor Plan

CONFLICT OF INTEREST

None

RECOMMENDATION

The Planning Commission and staff recommend the City Council approve CUP2011-05, subject to the conditions listed in Exhibit "A."

EXECUTIVE SUMMARY

The applicant is requesting a conditional use permit (CUP) to operate an indoor firearms range within an existing industrial building at 1173 Dayton Avenue. Approval of this CUP by both the Planning Commission and City Council will allow the applicant to proceed with a tenant improvement and operation of the use.

Issues to consider with this use include impacts related to parking, noise, and public safety.

BACKGROUND

- General Plan Designation: Industrial
- Existing Zoning: M-1 (Light Industrial)
- Lot Size: 1.34 acres
- Current Land Use: Industrial office, warehouse, manufacturing
- Adjacent Land Uses: North: Single Family Residential
South: Industrial
East: Industrial
West: Industrial
- Previous Entitlements: R83-16 (AL-20 to M-1)
SPR2007-33 (Industrial Building)

PROPOSAL AND ANALYSIS

Applicant's Proposal and Operational Statement

Indoor firing ranges are popular among law enforcement and recreational shooters because they offer protection from inclement weather conditions and can be operated under controlled environmental conditions. The applicant has provided the following operational statement in support of the application:

"The purpose for this Conditional Use Permit application is to obtain approval to set up and operate an indoor shooting facility at 1173 Dayton Ave. in the City of Clovis. This facility will be open to the public and will not restrict participation in its use in any way except for those persons who, by law are ineligible to own or possess firearms.

"The range will be set up as a 25 yard Bulls Eye Range. This means that shooters will shoot down range from a fixed firing position at a target that is directly in front of the shooter. The Bulls Eye Range does not allow for any "cross range shooting." The shooter will always be firing directly at the bullet trap. The targets will be moved up and down range by an automated target carrier. This allows shooters to always remain behind the firing line without having to cross the firing line to move or replace targets. This allows for the safest use of the range. The facility will allow the use of pistols up to .44 magnum, small bore rifles and shotguns (limited to use during instruction only).

"The indoor shooting facility will be open 7 days a week for shooting and the sale of firearms and other shooting related items such as ammunition. The main focus of this facility will be target shooting with ancillary retail sales and firearm safety instruction. The hours of operation will be determined later based on usage, but be within the hours of 9 a.m. and 10 p.m."

As depicted in the attached exhibit, the shooting area will be a large room constructed within the existing building. This containment area's wall will be constructed of concrete and located north of the showroom. It will be accessible through a vestibule adjacent to the retail area with a door on each end. Customers will enter the vestibule area and be provided with safety glasses and ear protection prior to entering the firing area. The vestibule will limit the escape of noise since both doors will rarely be open at the same time.

The firing range will be oriented so shooters fire north toward the back wall. Bullet traps installed by the applicant in the target area will be the primary containment for projectiles. Secondary containment will be the shooting area's interior walls and roof materials. Space behind the target area barrier will provide a storage area (see Exhibit C).

A retail/office showroom is proposed within the building where ammunition and firearms could be purchased or rented.

Background on Conditional Use Permits

"California Government Code authorizes local agencies to issue conditional use permits when authorized to do so by local ordinance. Uses that are not permitted as a matter of right may be permitted by a conditional use permit. These permits are granted only if the use is compatible with the proposed location. A CUP allows desirable but potentially problematic uses in a particular zone on a case-by-case basis. Because of potential noise, traffic, and congestion effects on property values, the (City) does not allow the use by right. Rather, the (City) approves the use with restrictions, in the form of conditions, tailored to fit the special problems that the use permits. CUPs must be consistent with the (Clovis) general plan."

"Because a CUP is a discretionary action, not a right, the (City) should grant the permit only if there are facts in the record to support the grant and the (City) makes the required findings and follows the required procedures."

"Conditions must be reasonably related to the impacts of the project as permitted by the CUP approval."¹

Consistency with General Plan and Zoning

Staff has evaluated the Project in light of the General Plan Land Use Element Goals, Policies, and Action Items. The following goals and policies reflect Clovis' desire for a balanced community that is economically vital, provides for a variety of housing needs, and retains its agricultural and small town character, while at the same time maintaining a predominant position in the region.

¹ California Land Use Practice, Volume 1, July, 2007

Goal 6:

Revitalized areas currently characterized by a mix of vacant and underutilized properties, outdated design or poorly maintained development.

Policy 6.1: Assist in and promote the development of vacant infill and underutilized parcels in the City.

Policy 6.2: Promote for the continued revitalization and intensification of selected opportunity areas within the City.

Policy 6.3: Promote the conservation and rehabilitation of existing land uses.

Actions

- Promote the development of commercially designated areas in the central and southwest areas of the City before expanding into new development areas.
- Focus revitalization activity along the Shaw Avenue, Herndon Avenue and Clovis Avenue corridors.

The project site was rezoned to M-1 (Light Industrial) in 1983 and was developed in 2007 for industrial manufacturing and service uses. The Clovis Municipal Code §9.3.304(B)16, permits firearms ranges within any zone district with an approved conditional use permit.

Project Location and Surrounding Properties

The project is located on Dayton Avenue, east of Clovis Avenue at the southernmost border of the City of Clovis. The project is zoned M-1 (Light Industrial) and surrounded by single-family residential to the north and industrial uses to the east, west, and south.

Site Plan and Parking

The project site is approximately 1.34 acres. In 2007, the property owner constructed a 21,576 square foot industrial building, parking, associated landscaping, and perimeter walls. There are approximately 48 parking spaces on the site, one loading zone and two trash enclosures (see Exhibit B). Sufficient on and off-street parking is available for the proposed use.

Floor Plan

The applicant proposes to lease approximately 12,300 square feet for the indoor range. The proposed use includes a firing range, office, showroom and storage (see Exhibit C).

As noted, a retail/office showroom is proposed within the building where ammunition and firearms could be purchased or rented. Retail sales are not permitted within the M-1 Zone District as a primary use, however, ancillary sales related to a primary industrial use is allowed. The proposed retail/office area is approximately 1,547 square feet which is approximately 12.5% of the floor area.

The remainder of the warehouse building is currently occupied by two cabinet shops.

Noise

The Noise Element of the General Plan is a mandatory component pursuant to State law (California Planning and Zoning Law, §65302(f)). Residential uses are identified in the Noise Element as sensitive receptors. 65 dBA CNEL is widely considered the maximum exterior level acceptable for these uses. Noise sensitive uses are generally permitted in areas with ambient environments in excess of 65 CNEL if mitigation (such as roof and ceiling insulation, dual-pane windows) is provided to reduce noise to acceptable levels.

The following General Plan Noise Element policies are relevant to the proposal:

- Policy 1.4: Require proposed industrial or commercial projects locating near existing or planned residential areas to demonstrate that the project when constructed, will comply with the City noise requirements.
- Policy 1.7: Minimize noise conflicts between land uses and the circulation network.
- Policy 2.1 Limit the maximum permitted noise levels which cross property lines and impact adjacent land uses.
- Policy 2.4 Evaluate potential noise conflicts for individual sites and projects.

Peak sound pressure level measurements conducted at indoor firing ranges ranged from 157–168 decibels (dB).² The applicant's operational statement states that eye and ear protection will be available to customers. It is also common that customers who own firearms provide their own personal eye and ear protection.

The proposed site is zoned for industrial uses which may operate up to 24-hours per day. The proposed use is permitted in any zone district with an approved CUP. Due to the nature of the business and incidental noise that may be associated with such use, the M-1 Zone District is an appropriate area for a firing range. The range however, conditions to reduce the potential that noise nuisances would interfere with the adjacent residential uses are recommended.

² *Noise Control Solutions For Indoor Firing Ranges*, C. Kardous and W. Murphy, Noise Control Engineering Journal / Volume 58 / Issue 4, 2010
CUP2011-05

The building is currently occupied by a cabinet shop and door company, both of which use nail guns, electric saws and other equipment in their operation. There is no code or condition in the M-1 Zone District for uses that are "permitted by right" to keep doors closed during the manufacturing process. It is common for cabinet shops to operate with their doors open.

Construction of the interior shooting area—composed of R-6 insulated concrete walls and R-10 insulated roof—in addition to the existing building, will reduce the potential escape of nuisance noise and associated potential impacts to the residential properties to the north.

The proposed firing range is being processed through a conditional use permit, providing an opportunity to incorporate conditions of approval to address issues that may be associated with the use. In this case, it is appropriate to include conditions to help reduce the noise levels including keeping the exterior doors closed, prohibiting loitering adjacent to residential properties, and limiting the hours of operation. A recommended noise control condition is included in Exhibit "A" to establish a noise level experienced at the residential property line and within habitable spaces.

Safety

Indoor firing ranges are uses that can have potential effects on human health, including but not limited to wayward projectiles and airborne lead. This report analyzes the proposal from the perspective of planning and zoning and recommends conditions that are intended to protect the public health and welfare through implementation of plan policies and zoning standards. These regulations are complemented by additional protection to health and safety by the California Building Code and workplace regulations of CalOSHA, and other state and federal workplace safety regulations.

The applicant has advised staff that he is using the *NRA Range Sourcebook* as a guide to plan and construct the proposed shooting range. This document "provides both basic and advanced guidance to assist in the planning, design, construction and maintenance of shooting facilities."³ The applicant has also completed the NRA's Range Development Course and is consulting with a Range Technical Team Advisor for the NRA.

Because the construction of Project will be subject to the California Building Code (CBC) and its operation will be subject to workplace safety regulations, no additional condition that duplicates or reiterates these regulations is recommended.

Hours of Operation

The applicant is requesting to operate seven days per week from 9:00 am to 10:00 pm. The code does not restrict uses within the M-1 Zone District, however due to the

³ <http://www.nraibq.org/shootingrange/sourcebook.asp>

proximity to a residential area, staff recommends a condition limiting the hours of operation per the applicant's request.

Neighborhood Comments

Staff sent notices to property owners within 300 feet of the project site. Staff received a petition signed by several neighbors in opposition to the project. Two neighbors were present at the Planning Commission who spoke in opposition.

Comments raised during the Planning Commission concerned additional traffic impacts to the residential neighborhood to the north, noise and safety.

California Environmental Quality Act (CEQA)

The City has determined that this Project is exempt from CEQA pursuant to Public Resources Code §15061(b)(3) which provides that CEQA applies only to projects that have the potential for causing a significant effect on the environment. A Notice of Exemption has been completed during the preliminary review, and is kept for public review with the project file during the processing of the project application. Staff will file the notice with the County Clerk if the project is approved.

The City published notice of this public hearing in the *Fresno Bee* on Thursday, November 10, 2011.

FISCAL IMPACT

None

REASONS FOR RECOMMENDATION

"Conditional use permits are quasi-judicial, requiring an administrative decision maker to ascertain facts in a specific case, to exercise discretion in applying the law to those facts, and to draw conclusions and adopt findings to support those conclusions."⁴

The project is consistent with the goals and policies of the General Plan. The proposed site is zoned M-1, which provides for industrial uses. The proposed indoor firearms range is identified as a use permitted in any zone district with a conditional use permit.

This staff report and attachments provide the evidentiary support for the necessary findings for approval of a conditional use permit application:

1. That the site for the proposed use is adequate in size and shape to properly accommodate such use;

⁴ California Land Use Practice, Volume 1, July, 2007.

2. That the street plan in the neighborhood is adequate to handle the traffic generated by the proposed use;
3. That the proposed use will have no adverse effect on abutting properties and the permitted use thereon;
4. That the conditions of approval stated in the resolution are deemed necessary to protect the public health, safety, and general welfare; and
5. That CUP2011-05 is exempt from CEQA pursuant to CEQA Guidelines Section 15061 (b)3. Based on evidence contained in the record, CUP2011-05 does not have the potential for a significant impact to the environment.

In light of this, Planning Commission and staff recommend that the City Council approve CUP2011-05, subject to the conditions of approval listed as Exhibit A.

ACTIONS FOLLOWING APPROVAL

None

NOTICE OF HEARING

Property Owners within 600 feet notified:	45
Interested individuals notified:	10

Prepared by: Bryan Araki, Senior Planner

Submitted by:



David E. Fey, AICP
Deputy City Planner



Dwight Kroll, AICP
Director of Planning and
Development Services

J:\Planning Projects\CUP\CUP 2011\CUP2011-05 (Pistol Range)\Documents\CC Staff Report CUP2011-05.doc

**FIGURE 1
PROJECT LOCATION MAP**

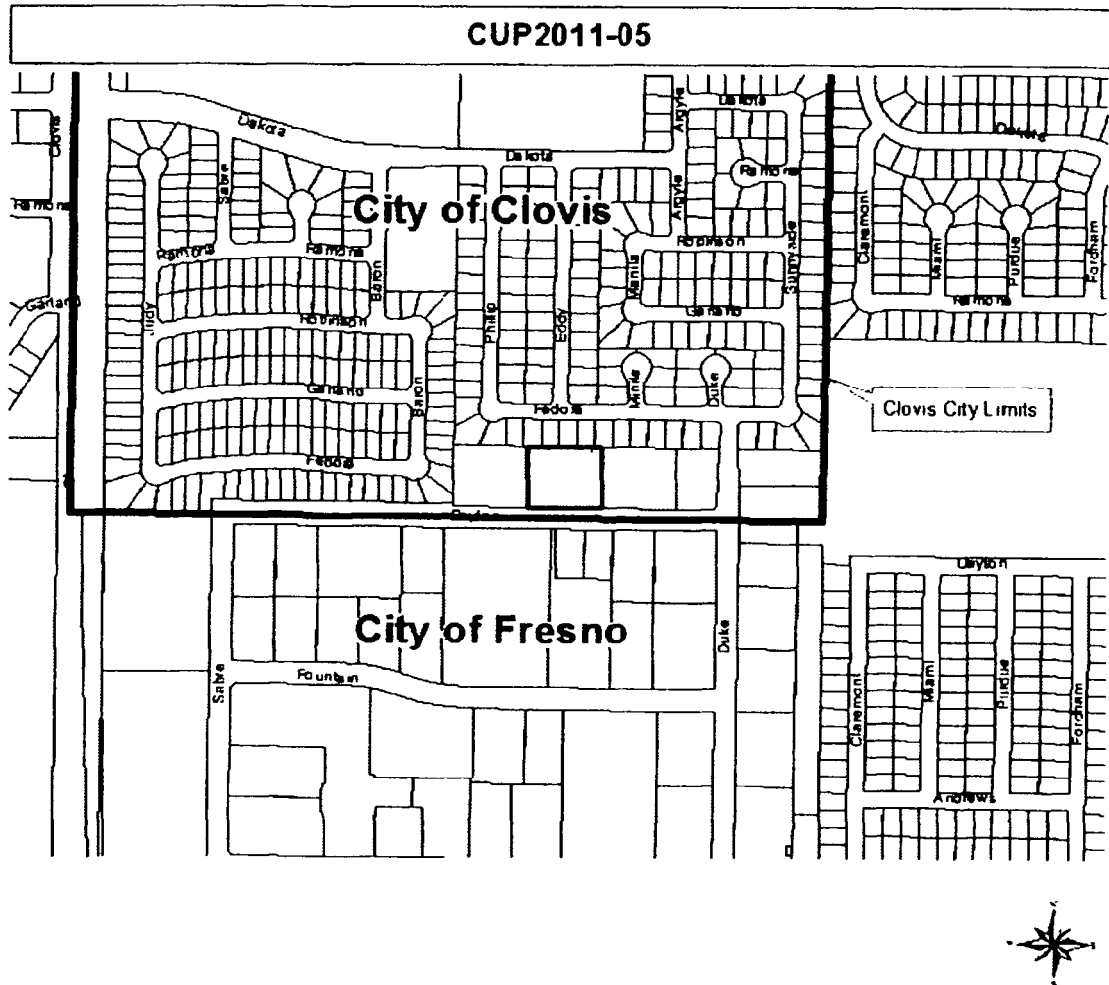


EXHIBIT "A"
Conditions of Approval – CUP2011-05

Planning Division Conditions

(Bryan Araki, Division Representative – (559) 324-2346)

1. Conditional Use Permit CUP2011-05 may be reviewed in one year (following occupancy) for compliance with the conditions of approval. Planning staff shall conduct a review of the use and present these findings to the Planning Commission. Should the use be found to be in noncompliance, the Commission may schedule the use permit for revocation.
2. Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. daily. Modification to the hours of operation will require an amendment to the conditional use permit.
3. Cessation or abandonment of this use for a period exceeding 90 days shall be cause for scheduling of a revocation hearing for this conditional use permit.
4. Outdoor speaker systems are not permitted as part of this use.
5. The applicant/property owner shall maintain the existing six-foot high masonry wall on the north property line and repair any broken or missing elements.
6. Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses. All noise generating equipment such as compressors and pumps shall be located within the proposed building.
7. Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit. All lighting shall be screened from direct view from the public right-of-way and adjacent residential properties.
8. The operator shall discourage loitering and gathering of customers in the parking area near the north property line.
9. Exterior doors of the business shall not be propped open during operation of the firing range.
10. Signs shall require a separate permit and comply with the Clovis Sign Code. An individual freestanding sign is not permitted for each separate use.

Fire Department Conditions

(Gary Sawhill, Department Representative – (559) 324-2224)

11. The applicant shall install emergency lighting with battery backup or an approved alternate.
12. Exit door operation shall not be impeded by any device when the building is occupied. Any delayed egress system shall comply with California Building Code (CBC).
13. No locks are permitted to prevent the operation of doors except the main exterior door meeting the requirements of 1008.1.8.3 CBC. The unlatching of any door shall not require more than one operation.
14. The path of exit travel to and within exits in a building shall be identified by exit signs conforming to the requirements of CBC.
15. Fire apparatus access roads shall have an unobstructed width of not less than twenty-six feet (26') to all buildings and an unobstructed vertical clearance of not less than thirteen feet-six inches (13' 6").
16. The applicant shall install approved fire extinguishers, 2A-10BC minimum rating, one (1) per each 3,000 square feet, with a maximum travel of seventy-five feet (75') from any point in building. These should be located and approved by the Clovis Fire Department prior to building occupancy.
17. All valves controlling the water supply for automatic sprinkler systems and water-flow switches on all sprinkler systems shall be electrically monitored for integrity.
18. The Applicant/Tenant shall be responsible for ensuring the existing fire protection and/or fire alarm system(s), existing in this building shell, are currently operational and in compliance with existing maintenance standards prior to final inspection of this tentative improvement. Contact the Clovis Fire Department for current status on the applicable systems.
19. Any tenant improvements of a building involving changes to walls, ceilings, storage heights shall not affect the operation and coverage of an existing fire suppression system(s). All additions or changes to any sprinkler system require Clovis Fire Department review and approval.
20. All carpets, decorations and paneling shall comply with Title 19 requirements. Flame-resistant certificates shall be submitted to the Clovis Fire Department before any installation regarding this department.

Police Department Conditions

(Vince Weibert, Department Representative – (559) 324-2400)

21. All firearms and ammunition will be secured as specified in compliance with PC 12071(b) (14).
22. The business shall be alarmed and the alarm monitored by an alarm monitoring company. Alarm shall protect the business itself and locations inside the business where firearms and ammunition are stored while the business is closed as well as include a panic alarm.
23. The exterior and interior of the business shall be monitored and recorded by video monitoring equipment. Locations monitored shall include but not be limited too; exterior parking areas, primary exterior approaches to the business, retail areas.
24. No alcoholic beverages or intoxicating substances permitted on the premises.
25. Emergency phone numbers for responsible parties shall be kept current during the building phase of the project so Clovis Police Department can properly contact those parties in the event of thefts and/or emergencies occurring on the property.
26. It shall be the responsibility of the property owner to maintain the structures and adjoining fences to the project free of graffiti. All forms of graffiti shall be removed within 72 hours.
27. Property maintenance and general condition of the property's worksite shall remain in compliance with the Clovis Municipal Codes and standards set forth by the City of Clovis. This pertains to excessive garbage and debris, which may be strewn about the worksite and scattered into already established neighborhoods, parks, and roadways.
28. Building shall be equipped with perimeter lighting to illuminate all areas of the exterior, including walkways, doors, and windows during hours of darkness. Lighting shall not be directed toward or negatively impact residential uses.
29. Rear doors to the building (if applicable) shall be equipped with peepholes, providing views for a 180 degree angle.
30. Caretakers and/or outdoor camping shall not be permitted on this site unless specifically approved under a separate conditional use permit.

Engineering Division Conditions

(Chris Tange, Division Representative – (559) 324-2360)

31. If the applicant is required to make onsite ADA path of travel improvements, then applicant may be required to remove and replace concrete improvements along the property frontage that do not meet current City of Clovis and ADA standards.
32. The applicant shall remove and repair all damaged or broken concrete improvements, such as the damaged curb about 100 feet west of the east property line.

CLOVIS PLANNING COMMISSION MINUTES
October 27, 2011

E) Consider Approval – Res. 11-31, CUP2011-05, A request to approve a firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue. Matthew and Janet Gross, owners; Jacob Belemjian, applicant.

Araki presented the staff report on this item and indicated that staff recommends approval of CUP2011-05, subject to the conditions of approval listed in Exhibit "A."

Commissioner Grogan mentioned that he noticed a cabinet shop with its doors open the day he drove by the applicant's site, and asked what might be the noise comparison for that use compared to that of a firing range. Araki replied that industrial areas create noise, and the standards are based on a 24 hour measurement, whereas noise that is considered nuisance noise is more of a single event and is a code enforcement issue. Commissioner Grogan then asked if there is a decibel test that was applicable to this situation, and asked what the noise would be outside of the building. Araki described the physical construction that would reduce the noise.

At this point, the public portion of the meeting was opened to anyone wishing to speak in support of this item.

Jacob Belemjian (applicant), 7551 N Leonard, presented a PowerPoint presentation illustrating a general overview of the business plan, the construction standards that will apply to the property and addressed various safety concerns.

Commissioner Grogan asked what the decibel level for a shotgun is. The applicant responded that it was approximately 125 decibels.

Commissioner Grogan asked that with 6 employees, will there be a range master at all times?

The applicant responded by saying that there would be supervision by closed circuit TV as well as by employees.

Commissioner Grogan asked, who can use this facility? Could a 10 year old use it? What are the restrictions?

The applicant responded by saying that a customer must be of legal age to own a weapon to use the range. At age 18, they can shoot rifles, but not pistols. At age 21 they shoot anything that is allowed on the range. Their policy will be that a 12 year old accompanied by a parent could use the range.

ATTACHMENT 1

Commissioner Domingos asked about the hours of operation, saying that from 9-10 seems long, but perhaps that is to allow flexibility?

The applicant stated that he wants the hours of operation due to those customers who wish to take classes after working hours.

Dale Drozen, Whiteash Avenue stated his support of the application and asks if there will there be CCW (Carry and Conceal Weapon) training and would like to know the number of lanes that will be available. He also asked about the ordinance prohibiting shooting of a firearm within city limits, and wants to know how that applies, if at all, to this situation. He stated that Clovis needs a range, would be convenient and would benefit Clovis economically.

Araki stated that the number of lanes will be phased in, from eight lanes initially planned up to twenty. There will also be CCW training available. As to the issue of shooting within city limits, the firing range is exempt from that prohibition.

Rick Zimmerman, 424 N Miami, Fresno, expressed support of a range like this one on this side of town. He said that it seems as if it will be very safe and quiet operation, and said that the range that is in Fresno is very quiet.

At this point, the public portion of the meeting was opened to anyone wishing to speak in opposition of this item.

Marcus Alavera, 1324 Fedora, spoke against the project, saying that it is in his neighborhood and that he does not want it there. He says that he has had confrontations with other industrial property owners there. He cites the ex-convicts in the neighborhood, and repeats that he does not want it in his neighborhood.

Chair Ayello asks him to limit his comments to the Commission and to limit it to two minutes. Mr. Alvera expresses concerns about the health consequences of spent shells, and objected loudly to the application.

Bruce Meredith, 1224 Fedora, spoke against the proposal, citing more traffic through this neighborhood, people with guns in the neighborhood, and noise from the traffic. He does not want this in his neighborhood. He loves guns, but not in his backyard. He suggests that the applicant choose another location.

Applicant chooses to make a rebuttal, citing containment measures for the lead dispersal, and says that he intends to operate a clean, quiet and safe operation. He says that the attitude "Not in My Backyard" is not an excuse, and will do everything in his power to not create problems with the neighbors.

Commissioner Grogan commented that his first concern was noise and safety issues, but when he drove by he saw a nice facility. He is convinced that there are enough reviewing mechanisms available with a conditional use permit, and that the application can be reviewed anytime. Commissioner Grogan stated that he does not see that

noise abatement will be a concern, and that the biggest potential problem might be loitering outside the building.

Commissioner Domingos said that he feels that it is located in an appropriate place, and that we need one in Clovis. He feels that the applicant has made a strong case. There are more interruptions from Mr. Alvera and Mr. Meredith, and then vote is called for.

There being no further discussion, the public portion of the hearing was closed.

A motion was made by Commissioner Domingos, seconded by Commissioner Hatcher, to adopt P.C. Res. 11-31, recommending approval of CUP2011-05. This motion was passed by a vote of 4-0-1.

AYES:	Commissioners Domingos, Grogan, Hatcher, Chairperson Ayello
NOES:	None
ABSENT:	Commissioner Mouanoutoua
ABSTAIN:	None

DRAFT

RESOLUTION 11-_____

A RESOLUTION OF THE CITY COUNCIL FOR APPROVAL OF CONDITIONAL USE PERMIT CUP2011-05 TO ALLOW A FIREARMS SHOOTING RANGE WITH ANCILLARY RENTAL AND SALES OF FIREARMS EQUIPMENT IN AN EXISTING INDUSTRIAL BUILDING LOCATED AT 1173 DAYTON AVENUE

WHEREAS, Jacob Belemjian, 7551 N. Leonard Avenue, Clovis, CA 93619, has applied for a Conditional Use Permit CUP2011-05; and

WHEREAS, this is a request to approve a conditional use permit for firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue, in the City of Clovis, County of Fresno, California, and

WHEREAS, after hearing thereon and consideration thereof, the Planning Commission, by its Resolution No.11- 31, has recommended conditional approval of CUP2011-05; and

WHEREAS, a public notice was sent out to area residents within 300 feet of said property boundaries ten days prior to said hearing, and

WHEREAS, on November 21, 2011, after hearing evidence gathered by itself and on its behalf and after making the following findings, namely:

1. That the site for the proposed use is adequate in size and shape to properly accommodate such use.
2. That the street plan in the neighborhood is adequate to handle the traffic generated by the proposed use.
3. That the proposed use will have no adverse effect on abutting properties and the permitted use thereon.
4. That the conditions of approval stated in this resolution are deemed necessary to protect the public health, safety, and general welfare.
5. That the City has determined that this Project is exempt from CEQA pursuant to Public Resources Code Section 15061(b)(3)

WHEREAS, on November 21, 2011, Council considered said application and after hearing and receipt of testimony relative thereto and consideration thereof finds and determines that said conditional use permit should be approved on the conditions hereafter provided.

NOW, THEREFORE, BE IT RESOLVED:

1. Conditional Use Permit application CUP2011-05 is hereby approved.
2. Said approval and conditional use permit are conditioned on the compliance by the applicant with each and all of the conditions set forth in Exhibit "A," which is on file with the City Clerk's office.

* * * * *

The foregoing resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on November 21, 2011, by the following vote, to wit:

AYES:

NOES:

ABSENT:

ABSTAIN:

DATED:

Mayor

City Clerk

**LETTER OF OPPOSITION
AND
NEIGHBORHOOD PETITION**

ATTACHMENT 3

Oct. 24, 2011

to the Clovis Planning
Commission

Received

OCT 27 2011

City of Clovis
Planning Dept.

to whom it may concern.

Re - CUP2011-05

I Lupe Sandoval am the owner of property
1214 Fedora, Clovis Ca 93612.

I also do not want CUP2011-05 - A Request
to approve a firearms shooting range (next to
& behind my property) with ancillary rental and
sales of firearms equipment in an existing industrial
building located at 1173 Dayton Avenue.

Please be advised that I as a property
owner do not want this firearms shooting range
to be located here. My rental property will be
seriously impacted if this goes as requested.

Sincerely

Lupe Sandoval
P.O. Box 817
Patterson Ca. 93648.

ph 559-646 3724

Received

OCT 27 2011

NO FIREARMS SHOOTING RANGE

We the undersigned homeowners oppose the approval of CUP2011-05. A request to approve Clovis firearms shooting range with ancillary rental and sales of firearms equipment in an industrial zone located at 1173 Dayton Avenue. Matthew and Janet Gross owners. Jacob Belemjian applicant. Published by Anonymous on October 14, 2011

PRINT FIRST and LAST NAME	ADDRESS
BRUCE McARDITH	1224 FEDORA AVE CLOVIS, CA 93612
Delia DeBURN	1144 FEDORA AVE. Clovis, CA 93612
Robert Frost	1144 FEDORA AVE Clovis 93612
Albert Easley	3745 Eddy Av. CLOVIS 93612
Alta Easley	3745 Eddy Av. CLOVIS 93612
Phillip Hester	1234 Fedora Ave Clovis 93612
Angie Pennington	1274 Fedora Ave Clovis 93612
Kevin Pennington	1274 Fedora Ave Clovis 93612
Carlos Gamboa	1334 Fedora Ave Clovis CA 93612
Bill Carl	3744 DUKE AVE Clovis 93612
Randolph LaJoie	3745 Manila Ave Clovis 93612
Lance Carmichael	3724 Manila Ave Clovis 93612
Igniter Carmichael	3724 Manila Ave Clovis 93612 *
Vons Vons	3744 Manila Ave
Shelley Hammond	1234 FEDORA CLOVIS CA 93612
Timothy A. Kelly	1294 Fedora Clovis CA 93612
Andrew Kelly	3735 Duke Ave Clovis 93612
Harry Kelly	3735 Duke Ave Clovis 93612
JOSE PREVIS	3725 DUKE AVE CLOVIS CA 93612
Jose Previs	3725 Duke Ave Clovis CA 93612
Shannae Cooke	3735 Manila Ave Clovis CA 93612
Shanel Cooke	1214 Fedora Clovis CA 93612
Ether Mendietta	1214 Fedora Clovis CA 93612
Michelle Devine	1354 Fedora Clovis Ca 93612
Craig Devine	1354 Fedora Clovis, CA 93612

NO FIREARMS SHOOTING RANGE

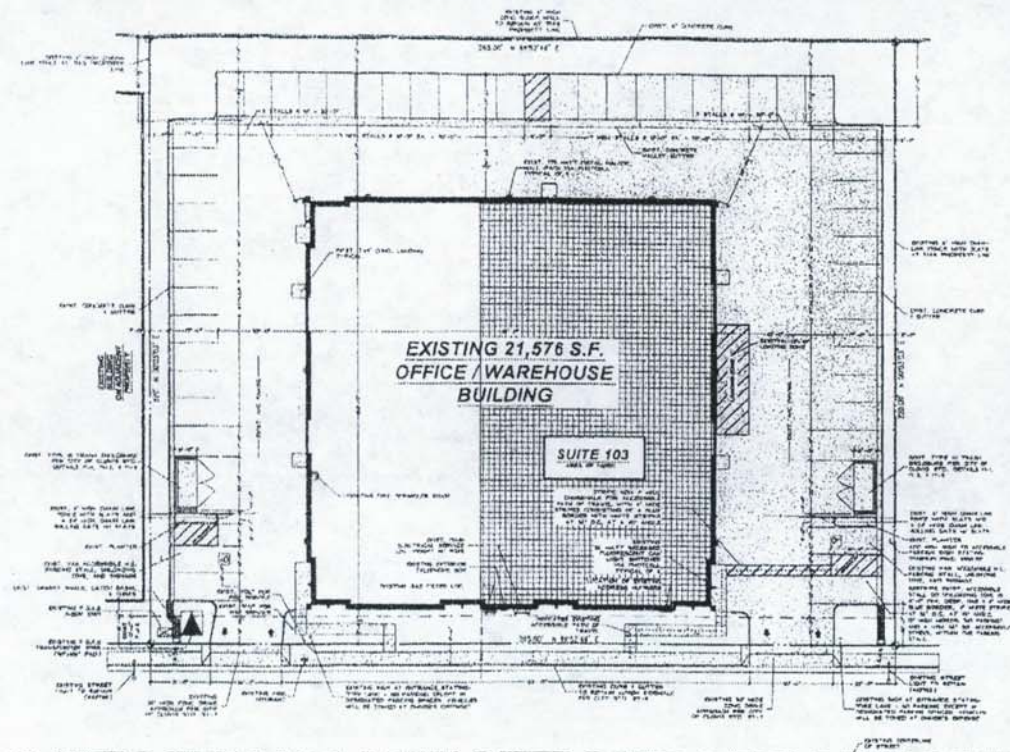
We the undersigned homeowners oppose the approval of CUP2011-05. A request to approve a firearms shooting range with ancillary rental and sales of firearms equipment in an industrial building located at 1173 Dayton Avenue. Matthew and Janet Gross owners. Jacob Belemjian applicant.

Published by Anonymous on October 14, 2011

PRINT FIRST and LAST NAME	ADDRESS
Mary Cornwell	1204 Fedora Ave
Sergio Perez	1184 Fedora Ave.
MARTIN PEREZ	1184 Fedora Ave.
Neysa Serna	1184 Fedora Ave.
Bill De Gruet	3734 Eddy Ave
XIM RASMUSSEN	3734 Eddy Ave.
Sigrid Muthenford	3725 Eddy Ave
Jim	3725 EDDY AVE
CHRISTOPHER GUERRERO	3735 Eddy Ave
Domitila Guerrero	3735 EDDY Ave.
Doug Mosier	1114 Fedora
Shannon Mosier	1114 Fedora Ave
LESLIE MOSIER	1114 Fedora Ave
DAVID J. SOLONDO	3745 Phillip Ave
MARCUS ALVARA	1324 Fedora Ave
Robert Weyant	1374 Fedora Ave Clovis
Linda Weyant	1374 Fedora Ave Clovis
Mary E Clark	3735 Phillip Ave Clovis
Harold Higgins	3744 PHILLIP AVE Clovis
Lora J Higgins	3744 Ph. 11. p Ave Clovis

[illegible]

BASIS OF BEARINGS



DAYTON AVE.

SITE PLAN

REVISIONS			APPROVALS		CITY OF CLOVIS <small>PLANNING AND NEIGHBORHOOD SERVICES DEPARTMENT</small>	
NO.	DATE	NAME			REVIEW NO.	PROJECT NO.
1		DEVELOPMENT REVIEW			1	
2		COMMUNITY DEVELOPMENT			2	
3		PLANNING			3	
4		NEIGHBORHOOD			4	
5		FINANCIAL			5	
6		LEGAL			6	
7		ENGINEERING			7	
8		UTILITY			8	
9		ENVIRONMENTAL			9	
10		ADMINISTRATIVE			10	
11		CONSTRUCTION			11	
12		SALES			12	
13		MARKETING			13	
14		RECORDS			14	
15		TRAINING			15	
16		RESEARCH			16	
17		ANALYSIS			17	
18		DESIGN			18	
19		CONSTRUCTION			19	
20		SALES			20	
21		MARKETING			21	
22		RECORDS			22	
23		TRAINING			23	
24		RESEARCH			24	
25		ANALYSIS			25	
26		DESIGN			26	
27		CONSTRUCTION			27	
28		SALES			28	
29		MARKETING			29	
30		RECORDS			30	
31		TRAINING			31	
32		RESEARCH			32	
33		ANALYSIS			33	
34		DESIGN			34	
35		CONSTRUCTION			35	
36		SALES			36	
37		MARKETING			37	
38		RECORDS			38	
39		TRAINING			39	
40		RESEARCH			40	
41		ANALYSIS			41	
42		DESIGN			42	
43		CONSTRUCTION			43	
44		SALES			44	
45		MARKETING			45	
46		RECORDS			46	
47		TRAINING			47	
48		RESEARCH			48	
49		ANALYSIS			49	
50		DESIGN			50	
51		CONSTRUCTION			51	
52		SALES			52	
53		MARKETING			53	
54		RECORDS			54	
55		TRAINING			55	
56		RESEARCH			56	
57		ANALYSIS			57	
58		DESIGN			58	
59		CONSTRUCTION			59	
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62		RECORDS			62	
63		TRAINING			63	
64		RESEARCH			64	
65		ANALYSIS			65	
66		DESIGN			66	
67		CONSTRUCTION			67	
68		SALES			68	
69		MARKETING			69	
70		RECORDS			70	
71		TRAINING			71	
72		RESEARCH			72	
73		ANALYSIS			73	
74		DESIGN			74	
75		CONSTRUCTION			75	
76		SALES			76	
77		MARKETING			77	
78		RECORDS			78	
79		TRAINING			79	
80		RESEARCH			80	
81		ANALYSIS			81	
82		DESIGN			82	
83		CONSTRUCTION			83	
84		SALES			84	
85		MARKETING			85	
86		RECORDS			86	
87		TRAINING			87	
88		RESEARCH			88	
89		ANALYSIS			89	
90		DESIGN			90	
91		CONSTRUCTION			91	
92		SALES			92	
93		MARKETING			93	
94		RECORDS			94	
95		TRAINING			95	
96		RESEARCH			96	
97		ANALYSIS			97	
98		DESIGN			98	
99		CONSTRUCTION			99	
100		SALES			100	

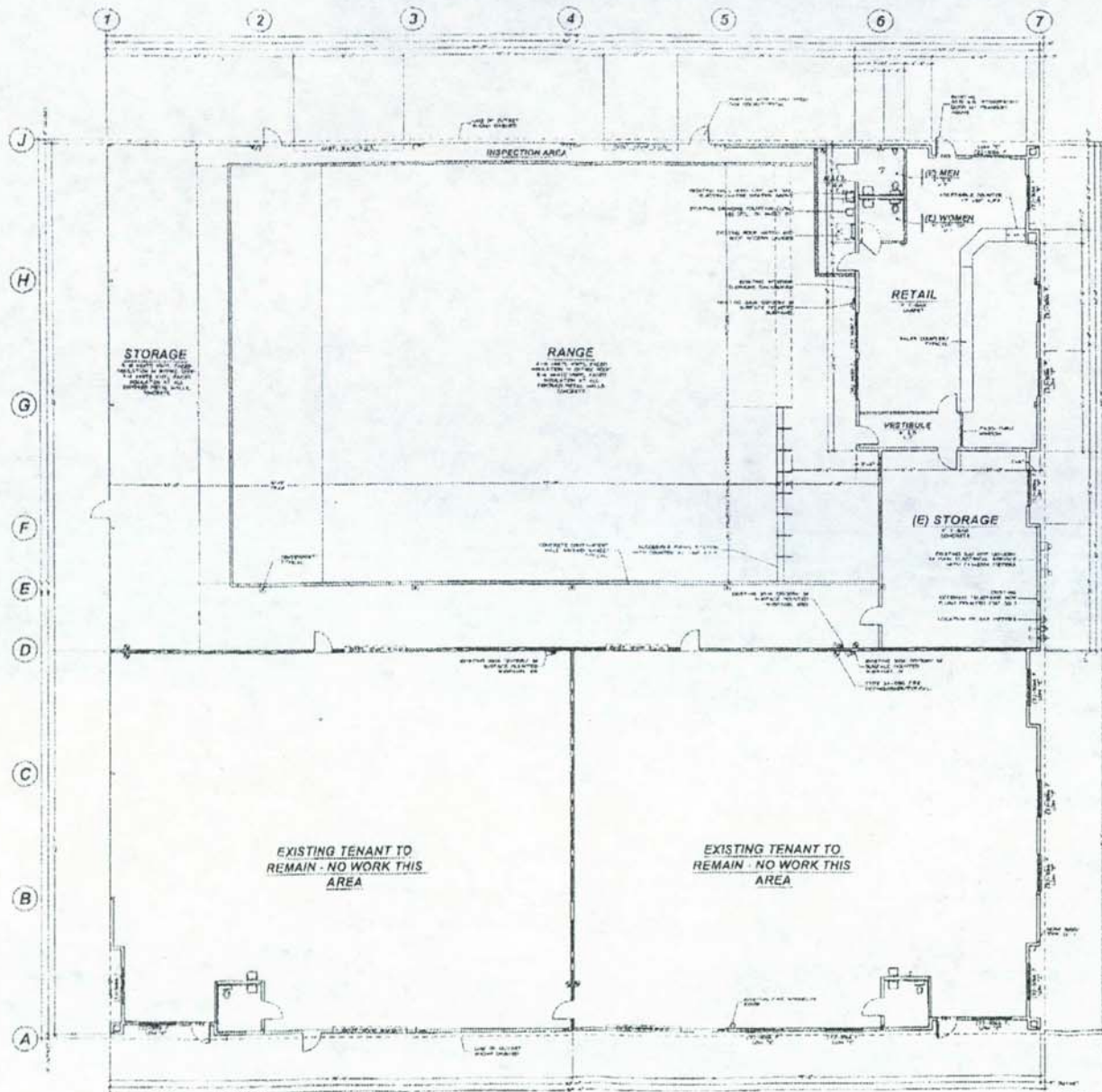
1173 Dayton Avenue, #103
Clovis, Ca. 93612

Proposed Tenant Improvement for a Indoor Shooting Range

Revisions		
#	Description	Date
▲		
▲		

Job No.
11-23
Name & Address
Assigned To
1113 Dayton Avenue, #102
Oviedo, FL 32762
Street No.

C-1



FLOOR PLAN



1173 Dayton Avenue, #103
Clovis, Ca. 93612

Proposed Tenant
Improvement for a
Indoor Shooting Range

Revisions	Description	Date
1	See Project 1 - 11-01	11-01

Job No.
11-01
Name & Address
1173 Dayton Avenue, #103
Clovis, Ca. 93612
Shooting Range

A-1

ATTACHMENT 4

RESOLUTION 11-124

A RESOLUTION OF THE CITY COUNCIL FOR APPROVAL OF CONDITIONAL USE PERMIT CUP2011-05 TO ALLOW A FIREARMS SHOOTING RANGE WITH ANCILLARY RENTAL AND SALES OF FIREARMS EQUIPMENT IN AN EXISTING INDUSTRIAL BUILDING LOCATED AT 1173 DAYTON AVENUE

WHEREAS, Jacob Belemjian, 7551 N. Leonard Avenue, Clovis, CA 93619, has applied for a Conditional Use Permit CUP2011-05; and

WHEREAS, this is a request is to approve a conditional use permit for firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue, in the City of Clovis, County of Fresno, California; and

WHEREAS, after hearing thereon and consideration thereof, the Planning Commission, by its Resolution No.11- 31, has recommended conditional approval of CUP2011-05; and

WHEREAS, a public notice was sent out to area residents within 300 feet of said property boundaries ten days prior to said hearing; and

WHEREAS, on November 21, 2011, after hearing evidence gathered by itself and on its behalf and after making the following findings, namely:

1. That the site for the proposed use is adequate in size and shape to properly accommodate such use.
2. That the street plan in the neighborhood is adequate to handle the traffic generated by the proposed use.
3. That the proposed use will have no adverse effect on abutting properties and the permitted use thereon.
4. That the conditions of approval stated in this resolution are deemed necessary to protect the public health, safety, and general welfare.
5. That the City has determined that this Project is exempt from CEQA pursuant to Public Resources Code Section 15061(b)(3)

WHEREAS, on November 21, 2011, Council considered said application and after hearing and receipt of testimony relative thereto and consideration thereof finds and determines that said conditional use permit should be approved on the conditions hereafter provided.

NOW, THEREFORE, BE IT RESOLVED:

1. Conditional Use Permit application CUP2011-05 is hereby approved.
2. Said approval and conditional use permit are conditioned on the compliance by the applicant with each and all of the conditions set forth in Exhibit "A," including modifications by the City Council as follows:
 - Amend Condition Number 2 to read, "Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m., Monday thru Friday, and 9:00 a.m. to 8:00

p.m., on Saturday and Sunday. Modification to the hours of operation will require an amendment to the conditional use permit."

- Modify Condition Number 8 to read, "The operator shall not allow loitering and gathering of customers in the parking area near the north property line."
- Add a condition to the Planning Division Comments to read, "The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap."

* * * * *

The foregoing resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on November 21, 2011, by the following vote, to wit:

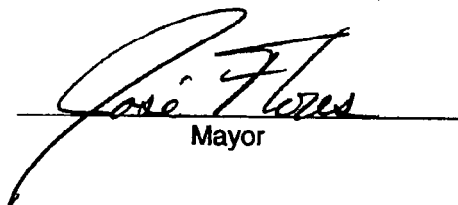
AYES: Councilmembers Armstrong, Magsig, Whalen, Mayor Flores

NOES: Councilmember Ashbeck

ABSENT: None

ABSTAIN: None

DATED: November 21, 2011


Mayor


City Clerk



EXHIBIT "A"
Conditions of Approval – CUP2011-05
(As amended and approved by the City Council on 11/21/2011)

Planning Division Conditions

(Bryan Araki, Division Representative – (559) 324-2346)

1. Conditional Use Permit CUP2011-05 may be reviewed in one year (following occupancy) for compliance with the conditions of approval. Planning staff shall conduct a review of the use and present these findings to the Planning Commission. Should the use be found to be in noncompliance, the Commission may schedule the use permit for revocation.
2. Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m., Monday thru Friday, and 9:00 a.m. to 8:00 p.m., on Saturday and Sunday. Modification to the hours of operation will require an amendment to the conditional use permit.
3. Cessation or abandonment of this use for a period exceeding 90 days shall be cause for scheduling of a revocation hearing for this conditional use permit.
4. Outdoor speaker systems are not permitted as part of this use.
5. The applicant/property owner shall maintain the existing six-foot high masonry wall on the north property line and repair any broken or missing elements.
6. Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses. All noise generating equipment such as compressors and pumps shall be located within the proposed building.
7. Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit. All lighting shall be screened from direct view from the public right-of-way and adjacent residential properties.
8. The operator shall not allow loitering and gathering of customers in the parking area near the north property line.
9. Exterior doors of the business shall not be propped open during operation of the firing range.
10. Signs shall require a separate permit and comply with the Clovis Sign Code. An individual freestanding sign is not permitted for each separate use.
11. The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap.

Fire Department Conditions

(Gary Sawhill, Department Representative – (559) 324-2224)

12. The applicant shall install emergency lighting with battery backup or an approved alternate.

13. Exit door operation shall not be impeded by any device when the building is occupied. Any delayed egress system shall comply with California Building Code (CBC).
14. No locks are permitted to prevent the operation of doors except the main exterior door meeting the requirements of 1008.1.8.3 CBC. The unlatching of any door shall not require more than one operation.
15. The path of exit travel to and within exits in a building shall be identified by exit signs conforming to the requirements of CBC.
16. Fire apparatus access roads shall have an unobstructed width of not less than twenty-six feet (26') to all buildings and an unobstructed vertical clearance of not less than thirteen feet-six inches (13' 6").
17. The applicant shall install approved fire extinguishers, 2A-10BC minimum rating, one (1) per each 3,000 square feet, with a maximum travel of seventy-five feet (75') from any point in building. These should be located and approved by the Clovis Fire Department prior to building occupancy.
18. All valves controlling the water supply for automatic sprinkler systems and water-flow switches on all sprinkler systems shall be electrically monitored for integrity.
19. The Applicant/Tenant shall be responsible for ensuring the existing fire protection and/or fire alarm system(s), existing in this building shell, are currently operational and in compliance with existing maintenance standards prior to final inspection of this tentative improvement. Contact the Clovis Fire Department for current status on the applicable systems.
20. Any tenant improvements of a building involving changes to walls, ceilings, storage heights shall not affect the operation and coverage of an existing fire suppression system(s). All additions or changes to any sprinkler system require Clovis Fire Department review and approval.
21. All carpets, decorations and paneling shall comply with Title 19 requirements. Flame-resistant certificates shall be submitted to the Clovis Fire Department before any installation regarding this department.

Police Department Conditions

(Vince Weibert, Department Representative – (559) 324-2400)

22. All firearms and ammunition will be secured as specified in compliance with PC 12071(b) (14).
23. The business shall be alarmed and the alarm monitored by an alarm monitoring company. Alarm shall protect the business itself and locations inside the business where firearms and ammunition are stored while the business is closed as well as include a panic alarm.
24. The exterior and interior of the business shall be monitored and recorded by video monitoring equipment. Locations monitored shall include but not be limited too; exterior parking areas, primary exterior approaches to the business, retail areas.
25. No alcoholic beverages or intoxicating substances permitted on the premises.
26. Emergency phone numbers for responsible parties shall be kept current during the building

- phase of the project so Clovis Police Department can properly contact those parties in the event of thefts and/or emergencies occurring on the property.
27. It shall be the responsibility of the property owner to maintain the structures and adjoining fences to the project free of graffiti. All forms of graffiti shall be removed within 72 hours.
 28. Property maintenance and general condition of the property's worksite shall remain in compliance with the Clovis Municipal Codes and standards set forth by the City of Clovis. This pertains to excessive garbage and debris, which may be strewn about the worksite and scattered into already established neighborhoods, parks, and roadways.
 29. Building shall be equipped with perimeter lighting to illuminate all areas of the exterior, including walkways, doors, and windows during hours of darkness. Lighting shall not be directed toward or negatively impact residential uses.
 30. Rear doors to the building (if applicable) shall be equipped with peepholes, providing views for a 180 degree angle.
 31. Caretakers and/or outdoor camping shall not be permitted on this site unless specifically approved under a separate conditional use permit.

Engineering Division Conditions

(Chris Tange, Division Representative – (559) 324-2360)

32. If the applicant is required to make onsite ADA path of travel improvements, then applicant may be required to remove and replace concrete improvements along the property frontage that do not meet current City of Clovis and ADA standards.
33. The applicant shall remove and repair all damaged or broken concrete improvements, such as the damaged curb about 100 feet west of the east property line.

ATTACHMENT 5

CLOVIS CITY COUNCIL MEETING

November 21, 2011

6:00 P.M.

COUNCIL CHAMBER

Meeting called to order by Mayor Flores
Flag Salute led by Councilmember Whalen

Roll Call: Present: Councilmembers Armstrong, Ashbeck, Magsig, Whalen
Mayor Flores
Absent: None

6:01 - PUBLIC COMMENT

Tim Hulce, resident, neighbors park their cars on the city street versus their garages and requested the city do something.

6:07 - CONSENT CALENDAR

Motion by Councilmember Ashbeck, seconded by Councilmember Magsig, that the items on the Consent Calendar be approved. Motion carried.

- A1) Approved - Minutes for the November 14, 2011 Council meeting.
- C1) Received and Filed – Community and Economic Development Status Report - July through September 2011
- D1) Received and Filed - Investment Report for the month of August 2011.
- D2) Received and Filed - Treasurer's Report for the month of August 2011.
- F1) Approved – Final Acceptance for CIP 09-24, Ashlan Avenue Streetscape.
- F2) Approved – Final Acceptance for CIP 11-03, Rubberized Cape Seal 2011.
- F3) Approved - A request to continue a Resolution of Necessity to determine that the Public Interest and Necessity require acquisition of property for public purposes; and Authorizing proceedings in Eminent Domain for two properties located in the vicinity of the southeast corner of Herndon and Temperance Avenues to the January 17, 2012 City Council Hearing. Address: 2640 Herndon Avenue; APN: 553-020-59; Owners: Lee Ann Kules, James Donald Roulland II, and Laura Jean Yager. Address: 2680 Herndon Avenue; APN: 553-020-60; Owner: Lawrence Ramalho, Trustee.
- G1) Approved – **Res. 11-123**, Amend the Fire Department Budget to reflect \$3,000 in grant funding awarded by the FY 2009 State Homeland Security Grant Program for Hazardous Materials Unit equipment.
- G2) Received and Filed – Fire Department Quarterly Report.

6:08 ITEM 1A - APPROVED – RES. 11-124, CUP2011-05, APPROVING A FIREARMS SHOOTING RANGE WITH ANCILLARY RENTAL AND SALES OF FIREARMS EQUIPMENT IN AN EXISTING INDUSTRIAL BUILDING LOCATED AT 1173 DAYTON AVENUE

Senior Planner Bryan Araki presented a report on a request to approve a firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue. Bryan Araki indicated that the applicant is requesting a conditional use permit (CUP) to operate an indoor firearms

range within an existing industrial building at 1173 Dayton Avenue. Bryan Araki indicated that approval of this CUP by both the Planning Commission and City Council will allow the applicant to proceed with a tenant improvement and operation of the use.

Ron Shepherd, area resident, spoke in opposition due to concerns with traffic. Jacob Valenjen, applicant, spoke in support. Mr. Valenjen also presented a presentation providing background information on the proposed project. Dale Drozen, resident, spoke in support of the project. Robert McVett, area resident, spoke in opposition due to concerns with traffic and noise. David Saranto, area resident, spoke in opposition due to concerns with traffic. Bruce Meredith, area resident, spoke in opposition due to having the shooting range firing direction towards the residential neighborhood. Discussion by the Council.

Motion by Councilmember Whalen, seconded by Councilmember Armstrong, for the Council to approve **Resolution 11-124**, CUP2011-05, approving a firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue with the added provisions to: 1. Amend Condition 8 to indicate "operator shall not allow loitering"; and 2. Note the structure shall meet the conditions of the National Rifle Association (NRA) Range Source Book which includes concrete walls and the baffles overhead and the capturing baffles (bullet trap) and the 12' wall to the north; and 3. Amend Condition 2 for hours of operation to 9 a.m. to 8 p.m. on Saturday and Sunday. Motion carried with Councilmember Ashbeck voting no.

7:08 **ITEM 1B – CONSIDERED - REPORT AND PROVIDE POLICY DIRECTION ON PLACEMENT OF ABOVE GROUND TRANSFORMERS IN RESIDENTIAL SUBDIVISIONS**

Planning and Development Services Director Dwight Kroll presented a report regarding policy direction on placement of above ground transformers in residential subdivisions. Dwight Kroll indicated that the Building Industry Association and local developers have asked the city to change the policy that currently requires underground transformers to be installed in new residential subdivisions. Dwight Kroll indicated that the cost to install underground transformers is approximately \$7500 per transformer more than above-ground transformers. Dwight Kroll indicated that each transformer serves on the average of twelve houses. Dwight Kroll indicated that if Council were to approve the use of above ground transformers, the developer would save an average of \$625 per housing unit. Dwight Kroll indicated that the building industry cites recent changes by PG&E that have significantly increased costs for installing underground transformers in the form of required soil testing for corrosivity and potential remediation measures. Dwight Kroll indicated that the City Council has already established policy, articulated in a joint workshop with the Planning Commission on October 29, 2001. Dwight Kroll indicated that it was the consensus of both the City Council and the Planning Commission that it was the policy of Council to discourage above ground transformers in residential neighborhoods. Dwight Kroll indicated that after considering the BIA's arguments, and conducting its own analysis of the policy, staff seeks the direction of City Council. Should the City Council wish to provide greater latitude in the use of above ground transformers, staff has provided a policy amendment for City Council's consideration.

Dale Drozen, resident, spoke in opposition to the proposal because they are graffiti magnets and the fact that smaller lots will make the above ground transformers much

larger. Michael Cunningham, resident, spoke in opposition due to aesthetics. John Wright, resident, spoke in opposition due to graffiti problems, proliferation of above ground boxes, possibility of having a car run into them, aesthetics, recommended that this should be based on exceptions, and develop some guidelines. Mike Prandini, representing the Building Industry Association, spoke in support of the request to allow staff discretion to allow for above ground transformer where appropriate. Discussion by the Council.

Motion by Councilmember Ashbeck, seconded by Councilmember Whalen, for the Council to continue to discourage above ground transformers but allow staff discretion when they should be allowed and develop some criteria that could be used in that analysis. Motion carried.

8:09 ITEM 1C - APPROVED – RES. 11-125, CUP2009-08A, AMENDING THE CONDITIONS OF CUP2009-08 TO REDUCE THE MINIMUM SETBACKS AND TO PERMIT PAD-MOUNTED PG&E TRANSFORMERS FOR PROPERTY LOCATED AT THE SOUTHEAST CORNER OF ASHLAN AND DEWOLF AVENUES

Senior Planner Bryan Araki presented a report on a request to amend the conditions of CUP2009-08 to reduce the minimum setbacks and to permit pad-mounted PG&E transformers for property located at the southeast corner of Ashlan and DeWolf Avenues. Bryan Araki indicated that the applicant is requesting to amend the conditions of approval for CUP2009-08 to allow for reduced setbacks and permit pad-mounted transformers within a previously approved planned unit development. Bryan Araki indicated that approval of this conditional use permit would allow the applicant to move forward with building permits for the subdivision.

Brent McCaffrey, applicant, spoke in support of the requests. Dale Drozen, resident, spoke in opposition to the requests. Jeff Harris, resident, spoke in support of the requests. Paul Hinkle, resident, questioned the driveway length. Bryan Araki responded. Discussion by the Council.

Motion by Councilmember Ashbeck, seconded by Councilmember Armstrong, for the Council to approve **Resolution 11-125, CUP2009-08A**, amending the conditions of CUP2009-08 to reduce the minimum setbacks and to permit pad-mounted PG&E transformers for property located at the southeast corner of Ashlan and DeWolf Avenues. Motion carried.

8:43 ITEM 1D - APPROVED – RES. 11-126, ESTABLISHING A TEMPORARY TWO-YEAR FEE REDUCTION ON SELECT DEVELOPMENT IMPACT FEES

Planning and Development Services Director Dwight Kroll presented a report recommending approval establishing a temporary two-year fee reduction on select Development Impact Fees. Dwight Kroll indicated that the City received a request from the Building Industry Association (BIA) to suspend the Parks, Fire, Police, and Library development impact fees for a two-year period. Dwight Kroll indicated that staff has met with the industry and collaborated to arrive at a program that reduces, instead of suspending, selected fee rates to arrive at a similar cost reduction for development. Dwight Kroll indicated that staff is presenting information regarding the effects of a temporary fee reduction program for Council's consideration and direction. Dwight Kroll indicated that if the Council finds that incentivization of development through reduction of

the fee burden is warranted, staff would recommend implementation of the fee reduction program instead of the suspension of entire fee categories.

Dale Drozen, resident, spoke in opposition to the requests. Mike Prandini, representing the BIA, spoke in support of the requests. Josh Peterson, developer, spoke in support of the requests. John Wright, resident, raised concerns with what is being proposed and the creation of a funding shortfall is the city does not collect certain fees. Alex Cazeri, resident, spoke in support of the requests. Discussion by the Council.

Motion by Councilmember Magsig, seconded by Mayor Flores, for the Council to approve **Resolution 11-126**, establishing a temporary two-year fee reduction on select Development Impact Fees with the added condition to bring the item back within twelve months for update or amending and allow staff to come back at anytime should they deem it necessary. Motion carried with Councilmember Whalen voting no.

10:14 ITEM 3A - CLOSED SESSION

Government Code Section 54957.6

CONFERENCE WITH LABOR NEGOTIATORS

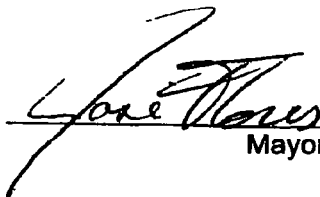
Agency Designated Representatives: R. Woolley, R. Ford, L. Shively

Employee Organization: Clovis Fire Fighters Association,
Clovis Police Officers Association,
Clovis Public Works Employees Affiliation,
Clovis Professional and Technical Employees Association,
Clovis Transit Employees Association,
Clovis Employees Association,
Clovis Public Safety Employees Association,
Non-Represented Employees, and
Management Employees

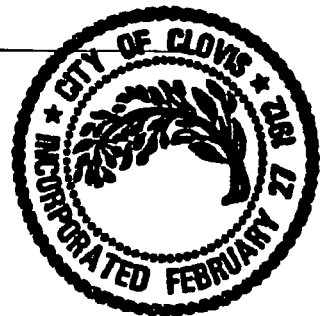
ADJOURNMENT

Mayor Flores adjourned the meeting of the Council to December 5, 2011

Meeting adjourned: 10:25 p.m.


Mayor


City Clerk



ATTACHMENT 6

[illegible]

REVISONS		APPROVALS		CITY OF CLOVIS PLANNING AND DEVELOPMENT SERVICES DEPARTMENT
REV. DATE	REVL			
Δ	_____	ACQUISITION REVIEW	_____	PROJECT NO.
Δ	_____	CONSTRUCTION MANAGEMENT	_____	UNLIMITED DOORS
Δ	_____	VALUES	_____	FOR MATT CROSS
Δ	_____	REVISE	_____	07-33
Δ	_____	FINISH	_____	SHEET NO.
Δ	_____	PLUMBING	_____	SHEET FOR
Δ	_____		_____	SITE PLAN
Δ	_____		_____	2 of 6

**1173 Dayton Avenue, #103
Clovis, Ca. 93612**

Proposed Tenant Improvement for a Indoor Shooting Range

Job No.
11-00
Name & Address
Proposed T.E.
1173 Dayton Avenue, #102
Clarks, Ca. 93612
Sheet No.

C-1

ATTACHMENT 7

CLOVIS MUNICIPAL CODE

9.3.219.1 Uses permitted (M-1).

The following uses shall be permitted in the M-1 District, plus such other uses as the Commission may deem to be similar and not more obnoxious or detrimental to the public health, safety, and welfare. All uses shall be subject to the property development standards set forth in Section 9 3 219 5 of this article and site plan review set forth in Section 9 3 408 of Article 4 of this chapter.

A RELATED USES

1. Acid sales and distribution,
2. Automobile repairs (conducted within a completely enclosed building),
3. Automobile and truck sales with incidental repairs and service (any repair and service shall be conducted within a completely enclosed building),
4. Automobile upholstery,
5. Building material supplies (new);
6. Building supply houses;
7. Dispensing machines, ice and food products (including midget marts);
8. Electrical supply houses,
9. Equipment rentals and sales,
10. Frozen food lockers,
11. Ice and cold storage plants,
12. Mechanical car, truck, motor, and equipment washes, including self-service;
13. Newspaper publishing;
14. Office uses which are incidental to and directly related to and serving the permitted industrial use,
15. Plant nurseries;
16. Plumbing supplies (within a completely enclosed building or solid masonry wall),
17. Radio broadcasting studios,

18. Signs subject to the provisions of Chapter 4 of this title,
- 19 Sign painting, and
20. Wholesale meat cutting and packing provided there shall be no slaughtering, fat rendering, or smoke curing

B. MANUFACTURING.

- 1 Aircraft modification, storage, repair, and maintenance,
- 2 Automotive:
 - a Battery assembly (including repair and rebuilding) limited to the use of previously manufactured components,
 - b Body and fender works;
 - c Engine rebuilding,
 - d. Painting;
 - e Reconditioning,
 - f Truck repairing and overhauling, and
 - g. Upholstering,
- 3 Boat building and repairs;
- 4 Bookbinding,
- 5 Bottling plants,
- 6 Ceramic products using only previously pulverized clay and fired in kilns using only electricity or gas,
- 7 Engine rebuilding,
- 8 Furniture manufacturing,
- 9 Furniture shops, custom,
10. Furniture upholstery shops,
- 11 Garment manufacturing,

12. Grain elevators;
- 13 Jewelry manufacturing,
- 14 Machine shops (no punch presses or drop hammers over twenty (20) tons)
 - a Blacksmith shops,
 - b. Cabinet or carpenter shops;
 - c. Electric motor rebuilding,
 - d. Machine shops,
 - e Manufacturing, compounding, assembly, or treatment of articles or merchandise from previously prepared metals;
 - f. Sheet metal shops,
 - g. Tinsmith shops, and
 - h. Welding shops,
15. Manufacturing, compounding, processing, packaging, or treatment of products such as:
 - a Bakery goods,
 - b Candy,
 - c Cosmetics,
 - d. Dairy products,
 - e Drugs,
 - f. Food products (excluding fish and meat products, sauerkraut, wine, vinegar, yeast, and the rendering of fats and oils) if connected with an adequate sewer system;
 - g. Fruits and vegetables,
 - h Honey extraction plants,
 - i. Perfumes, and

j Toiletries,

16. Manufacturing, compounding, assembly, or treatment of articles or merchandise from the following previously prepared materials;

a Canvas,

b Cellophane,

c Cloth,

d Cork;

e Felt;

f Fibre;

g. Fur;

h. Glass,

i Leather,

j. Metal;

k. Paper, no milling;

l Plaster;

m Plastic,

n Precious or semiprecious stones,

o. Shells,

p Textiles,

q. Tobacco,

r. Wood; and

s. Yarns,

17 Manufacturing and maintenance of electric or neon signs,

18. Petroleum bulk plants,

19. Planing mills,
20. Print shops, lithographing, publishing, and blueprinting,
21. Retail lumber yards,
22. Rubber and metal stamps;
23. Shoes,
24. Stone monument works;
25. Storage yards.
 - a. Boat livery or storage;
 - b. Contractors' storage yards;
 - c. Draying and freight yards;
 - d. Feed and fuel yards;
 - e. Machinery rental;
 - f. Motion picture studio storage yards;
 - g. Transit storage, and
 - h. Trucking yard terminals, except freight classifications;
26. Textiles;
27. Wet storage battery manufacturing; and
28. Wholesaling and warehousing.

C PROCESSING.

1. Blueprinting and photocopying,
2. Carpet and rug cleaning plants,
3. Cleaning and dyeing plants;
4. Creameries,

- 5 Hard chrome plating,
- 6 Laboratories (all types),
- 7 Laundries and dry cleaning plants, and
- 8 Tire retreading, recapping, and rebuilding (retail and wholesale)

D FABRICATION.

1. Assembly of plastic items made from finished plastic,
- 2 Assembly of rubber items made from finished rubber, and
- 3 Assembly of small electrical and electronic equipment;

E Communication equipment buildings,

F. Electric distribution substations,

G Electric transmission substations,

H. Parking lots and structures (public);

I Public utility service yards with incidental buildings;

J Telephone booths, temporary or permanent, and

K Water pump stations (Ord. 71-20, eff. September 15, 1971, as amended by § 11, Ord. 74-33, eff. February 5, 1975, § 3, Ord 75-46, eff July 1, 1976, and § 50, Ord 84-16, eff September 5, 1984)

ATTACHMENT 8

The Range Source Book

THE RANGE SOURCE BOOK

INTRODUCTION

**National Rifle Association
Range Department
11/99**

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ARTICLE 1. INTRODUCTION

1.01 The Range

- 1.01.1 Shooting ranges are places where people may participate in recreation, competition, skill development and training with firearms, archery equipment or air guns.

1.02 Purpose of Source Book

- 1.02.1 This source book provides both basic and advanced guidance to assist in the planning, design, construction and maintenance of shooting range facilities. This source book discusses methods and technologies which, if applied conscientiously, can result in a fuller and more rational use of land areas for range operations.
- 1.02.2 The purpose of a shooting range is to provide a location where people can enjoy various shooting sports. A shooting range should satisfy a number of goals, including the following: recreational shooting sports enjoyment; reasonable cost of construction and operation of the range facilities; and reasonable accommodations for the safety of both those utilizing the range and the general public. A reasonable satisfaction of these needs can only be achieved when one considers the entire context in which a particular facility will be operating, the type of shooting sports that will be conducted, the rules and controls that will be employed, the overall physical design of the range, and last, but not least, all aspects of the surrounding environment (terrain, population density, etc.).
- 1.02.3 Besides meeting the objective of allowing the range to function for particular shooting purposes and other functional considerations, an important concern is that the range satisfy reasonable expectations of safety for range participants and the public at large. A determination that a range satisfies such reasonable expectations can only be made by a thorough professional evaluation of the range.
- 1.02.4 The purpose of this source book is not, under any circumstances, to act as a substitute for such a thorough professional evaluation of a range. Such an evaluation should take into account all of the aforementioned considerations. This source book may not be used in lieu of the evaluation of engineers and architects that are required to design a range. The application of specific design features set forth in this source book requires an assessment of the functional utility of any such features for the range subject to evaluation by architects and/or engineers. This Source Book is merely provided for the purpose of furnishing certain general engineering, design and other strategies, information and ideas that may be employed, based upon the particular circumstances of a particular range, where there is a demonstrated need for such applications.
- 1.02.5 This source book will provide certain information and strategies and specifications that may or may not be useful or applicable, depending upon the particular circumstances and objectives of a particular range. The various designs, strategies, specifications, suggestions and information contained in this source book are not, merely by reason of their inclusion in the source book, intended to imply that all of them, or in fact any of them, are necessary or even applicable, to the design of every range or any particular range. For these reasons, this source book may not be utilized to establish design standards or criteria for ranges.

ARTICLE 2. DISCLAIMER

2.01 Disclaimer of Liability

- 2.01.1 The National Rifle Association does specify dimensions for range layout in NRA sanctioned shooting events, but does **NOT** certify or in any way approve ranges or range designs for any purpose. While every effort has been made to provide up-to-date technical information, this Source Book is in no way to be used as a substitute for, or in lieu of, consultation with architects, engineers and attorneys who should be called upon to make specific recommendations for individual range design, construction and use of shooting ranges. The Range Source Book is **NOT** a code book or certification standard, but rather a publication listing general suggestions. Each range is site specific, fact sensitive, risk driven, and needs to be considered in that light. The National Rifle Association assumes no liability for information contained herein.
- 2.01.2 In order to build and operate a safe shooting range, the plans, specifications and construction of said range require the thorough professional evaluation, guidance and services of professional engineers and architects. This source book is not, under any circumstances, to be used as a substitute for the necessary professional services of engineers and architects that are required to design and build a safe range.
- 2.01.3 This source book is under no circumstances to be viewed as a restatement of the law in any jurisdiction or to assure compliance with any applicable federal, state or local laws, ordinances, rules or regulations. You must consult a local attorney to ascertain compliance with all applicable federal, state or local laws, ordinances, rules or regulations and to advise you the applicable duty of care required of operators of a shooting range in your jurisdiction.
- 2.01.4 **NEITHER THE READER OF THIS SOURCE BOOK OR ANYONE ELSE IS TO: RELY ON ANY REPRESENTATION, DRAWING OR STATEMENT MADE IN THIS SOURCE BOOK; RELY ON THIS SOURCE BOOK TO DESIGN, BUILD, CONSTRUCT OR OPERATE A RANGE; RELY ON ANY CLAIM THAT A PARTICULAR RANGE IS IN COMPLIANCE WITH OR DESIGNED, BUILD, CONSTRUCTED OR OPERATED ACCORDING OR PURSUANT TO THIS SOURCE BOOK, WHEN VISITING, ATTENDING OR TAKING PART IN ACTIVITIES UPON OR AT SUCH A RANGE.**
- 2.01.5 **THE NRA EXPRESSLY DISCLAIMS ANY AND ALL LIABILITIES, LOSSES, COSTS, CLAIMS, DEMANDS, SUITS OR ACTIONS OF ANY TYPE OR NATURE WHATSOEVER, ARISING FROM OR IN ANY WAY RELATED TO: THIS SOURCE BOOK; THE USE OF THIS SOURCE BOOK; ANY REPRESENTATION, DRAWING OR STATEMENT MADE IN THIS SOURCE BOOK; OR, ANY CLAIM THAT A PARTICULAR RANGE IS IN COMPLIANCE WITH OR DESIGNED, BUILT, CONSTRUCTED OR OPERATED ACCORDING OR PURSUANT TO THIS SOURCE BOOK.**
- 2.01.6 This source book supersedes previous Range Manual publications produced by the National Rifle Association. Destroy previous publications.
- 2.01.7 NOTICE: Firing range safety implies (1) proper use of a range as it relates to the physical design; (2) continuous training (entry level and on-going) programs for users, instructors and supervisors; and (3) strict regulations on use coupled with strict enforcement.

**THE RANGE SOURCE BOOK
GENERAL INFORMATION**

**SECTION I
CHAPTER ONE
GENERAL INFORMATION**

**National Rifle Association
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ARTICLE 4. INDOOR RANGES

4.01 General Considerations

- 4.01.1 An indoor range is simply a range constructed indoors. The advantages over an outdoor range are: (1) virtually any location will work and (2) will allow for year-round activities. While there are obvious advantages over outdoor installations, user health and safety must be considered just as carefully. Additionally, indoor ranges must be designed so projectiles cannot penetrate the walls, floor or ceiling, and ricochets or backspatter do not harm range users. The following discussion is a broad guideline from which the builder of an indoor range can begin the process (Typical floor plan is shown on drawing IR-1)

4.02 Site Selection Factors

- 4.02.1 Site selection involves either a new structure or an existing structure. A new structure offers the advantage of original design, as well as flexibility for future needs. An existing structure and its use must comply with applicable zoning regulations. You are strongly advised to engage a local attorney licensed to practice law in your state to advise you in regard to the local zoning regulations. Consider multi-use buildings carefully, particularly for noise and dust contamination.

Caution: The use of existing structures often involves the removal of interior walls. Bearing walls should not be removed unless some provision is made for replacement support. Installing steel backstops requires additional support or modifications to keep floors from collapsing or steel plates from buckling.

- 4.02.2 Indoor ranges must incorporate walls and partitions capable of containing all projectiles fired on the range by containing or redirecting bullets into the backstop.

4.03 Range Layout and Features

- 4.03.1 On indoor ranges there are four main construction considerations: shooter needs, type of shooting activity, number of firing points, number of users. Special consideration must be given to ventilation, lighting, safety baffles and backstop design.
- 4.03.2 Specific dimensions are outlined for indoor ranges in Section III.
- 4.03.2.1 The following discussion dwells on certain standard basic and optional features for most indoor ranges. Air gun and archery ranges are also treated in the section, but require no special ventilation or illumination work or materials, but do require a quality light source. This chapter provides the size and shape of the typical indoor range as a guide for planning.
- 4.03.3 Ventilation
- 4.03.3.1 Indoor ranges require an internal atmosphere adequate to protect the health of workers as elevated blood lead levels are a potential threat to those who work in indoor ranges. Those who design and construct them must understand the cause of lead poisoning, the symptoms, the consequences of over-exposure and how to prevent it. It is equally important that they understand how to design ventilation systems for a particular shooting activity (see Section III, Chapter 2). You are strongly advised to engage the services of environmental engineers,

architects, etc., to advise you. You are also strongly advised to engage the services of an environmental attorney to advise you in regard to the applicable federal, state and local laws, statutes, ordinances and regulations regarding these matters.

4.03.4 Lighting

4.03.4.1 Light fixtures capable of reproducing "near daylight" conditions are best suited for indoor ranges. Modern technology makes it possible to blend light sources to reduce glare more effectively and aid in sharp vision. Proper lighting contributes greatly to the enjoyment and effectiveness of an indoor range (see Section III, Chapter 2).

4.03.5 Safety Baffles - Overhead and Side

4.03.5.1 Safety baffles to protect lighting fixtures, ventilation and heating ducts, pilasters (protrusions from the walls), electrical equipment, etc., may be incorporated into the overall design of the facility as needed.

- a. Material: The most common material is 10 gauge steel covered with wood to prevent backscatter.
- b. Configuration: To contain bullets effectively and reduce damage, protective baffles should be mounted as shown on drawings IR-3 and IR-4. Basically baffles are mounted at 25 degrees to the vertical and horizontal depending on their application, such as overhead to protect lighting fixtures, along walls to protect protrusions (drawing IR-1) and along the floor to protect exposed edges.
- c. Size: The size and placement of baffles depends on what surface areas require protection. Ceiling baffles (drawing IR-3), for example are wider than side baffles (see drawing IR-3).

4.03.6 Main Backstop

4.03.6.1 The main backstop is generally a fabricated steel plate or series of plates used for the purpose of stopping bullets fired on a range. In some instances backstop configurations and thickness of the plates will change according to the shooting activity. Different backstop designs utilizing rubber type materials are now also being marketed.

- a. Material: Steel backstops with sand or water pits are common, with rubber being the newest materials used in backstops. However, a few indoor ranges use earthen or sand backstops. **Caution:** Earthen or sand filled backstops can create health hazards for maintenance workers from silica and lead dust. They also cause excessive wear on ventilation fans.
- b. Configuration: There are many designs used for indoor ranges. Please see the Product & Services listing in the References Section, to obtain a list of range equipment manufacturers.
- c. Size: Backstops should extend from side to side and from ceiling to floor to protect the end of the range completely from penetration by direct bullet strike, prevent ricochets, backscatter and splatter erosion of side walls.

4.03.7 Range Distances

- 4.03.7.1 Indoor range's distances are based upon the type of shooting to be done and are generally defined in rulebooks. Distances may be altered to meet the dimensions of an existing building design; however, shorter distances may not qualify for NRA sanctioned tournaments. It is also pointed out that for new construction, costs for ranges longer than 25 yards/meters are often prohibitive. Distance accuracy must be + 3 inches. (See paragraph 3.03.2.1 for standard distances for air gun and BBgun.)
- 4.03.7.2 Most shooting activities can be conducted on indoor ranges. Many indoor ranges are constructed for .22 caliber and air gun use only. For those who plan to build an indoor range and want to use more powerful firearms, they must decide if the added cost for backstops, target retrieval systems, baffles, sound abatement and ventilation is worth the effort.
- 4.03.8 Range floor
- a. Material: The range floor should be constructed using a single pour and a fine-uniform-aggregate mix of concrete. Reinforcement: typically No. 4 steel rods placed 12 inches on center along with 6 inch x 6 inch 8/8 gauge welded wire fabric (wwf), but may vary according to soil conditions. Very large floor areas may require two or more pours with expansion joints between each slab. Consult a concrete construction firm for guidelines.
 - b. Design: The floor should slope beginning at the firing line, toward the target line one-quarter inch per foot. The floor should be no less than 4 inches thick.
 - c. Size: Size is governed by design. Remember increases in size will result in an increase in costs for ventilation, lighting, heating systems and overall building design. Decisions are usually based on the expected number of users vs. overall cost.
- 4.03.9 Firing Positions/Points
- a. Material: Same as for range floor. Use of floor coverings, such as carpeting requires the material to be flame-retardant and is generally not recommended. Frequent cleaning is required to remove powder residue and lead dust.
 - b. Design: Level. Floor slope should begin forward of the firing line and extend to the target line area.
 - c. Size: The length and width of each firing position will vary depending on each particular shooting activity. For example, a shooter in the prone position needs more space than a pistol shooter. A chart is provided on firing position sizes in paragraph 6.03.1 of the Appendix of this chapter. Allow space for administrative areas, such as staging, spectator, lounge, and class rooms. Competition rule books also specify minimum firing position (point) size.
- 4.03.10 Shooting Booths
- a. Material: Dimension lumber for framing, sheet metal for lining and regular (not tempered) masonite (with 1/4 inch holes 1 inch on center) for coverings.

- b. **Design:** Shooting booths may be set up to restrict shooter movement especially on pistol ranges. They may not be desirable for rifle ranges. Each booth should encompass the width of each firing position and extend 2 feet beyond and 18 inches to the rear of the firing line. Mount a table in each booth to restrict forward movement and for the shooter's use. This table may be hinged to provide easy access down range when authorized.

4.03.11 Walls

- a. **Material:** Poured concrete or masonry is preferred, but wood may also be used.
- b. **Design:** Wall thickness must conform to acceptable engineering standards and comply with national, state, county and local zoning codes. Usually no less than three 3 inches thick, reinforced walls must be designed to prevent the exit of any projectile.

Note: This specification usually requires the use of steel or similar material where wooden walls are used.

- c. **Size:** Depends upon building design, geological conditions and weather elements. Size includes height, thickness and length of running wall.

4.03.12 Ceiling

- a. **Material:** Ceiling material should be designed to reduce noise, protect lighting devices, reflect light and be impenetrable. Typically ceilings include, steel (10 gauge) baffles, 2 foot x 4 foot white acoustic panels and clear light panels.
- b. **Design:** A suggested maximum height of 8 feet above the floor level, with a smooth surface (acoustically treated) to allow for positive air movement down range. Baffles to protect adjoining areas should be above a false ceiling or designed into the roof/ceiling structure.

4.03.13 Floor Guards

4.03.13.1 Floor guards are provided to protect leading edges or protrusions, e.g., drains, or traps. Floor guards are designed to redirect errant bullets into the backstop area, thus minimizing damage to the range.

- a. **Material:** Floor guards are constructed from 10 gauge steel and may be covered with wood.
- b. **Design:** Floor guards are installed horizontally along the floor surface parallel to the firing line. These guards typically slope away from the firing line and at a 25-degree angle to the horizontal.
- c. **Size:** Floor guards should extend only as high as necessary to protect exposed surfaces.

4.03.14 Target Holders/Backers

- a. **Material:** Use soft pine, metal or combinations of both for frames. Corrugated cardboard is typically used for target backing material.

- b. Design: Target holders can be a simple upside down "T," to which two clips are affixed to hold targets. Target holders should be durable, yet easily changeable when damaged. Target holders for "backer" targets and turning target mechanisms are required for tournament operations.
- c. Size: Targets used on indoor ranges usually measure approximately 10 inches x 12 inches for pistol and 10 inches x 14 inches for rifle. The holder need only provide clip spacing adequate to hold the target in place.

4.03.15 Shooting Tables/Benches (for pistol only)

- a. Material: 5/8 inch plywood, 1/4 inch masonite and 2 inch x 2 inch (soft pine) dimension lumber (typical).
- b. Design: The shooting table is installed with the back edge coinciding with the firing line. Front and side panels must extend to the floor to protect the shooter from splatter from a premature discharge while the firearm is in the ready position. Below the table or bench top, include a shelf on which to place targets and shooting equipment. This shelf serves to prevent hazards associated with a cluttered bench/table. Maintaining an orderly table or bench contributes to an orderly firing line and a safe attitude on the part of shooters. Side screens may be added to control angles of fire, reduce noise and prevent spent cartridge cases from hitting other shooters.
- c. Size: Top of table/bench to be 36 inches above floor level, having a minimum surface area of 36 inches x 18 inches.

4.03.16 Floor drains

- a. Material: Cast iron soil pipe
- b. Design: Attach the drain pipe to a lateral drain located one foot forward of the backstop floor guard. (See drawing IR-1).

4.04 Range Control

- 4.04.1 Range control provides rules and supervision that encourages safe, healthful and proper use of a range. Remember that if you do promulgate range rules and regulations, be sure to enforce them. You may be held responsible for the damage or injury caused by your failure to enforce your range rules and regulations.
- 4.04.2 Posting Rules, Regulations and Signs
 - 4.04.2.1 See Section I, Chapter 2, Safety Plan.
- 4.04.3 Control Devices
 - 4.04.3.1 Safety devices control the physical use of an indoor range. Usually restrictive in nature, they include: warning lights, alarm bells, switch locations, etc. For example, an indoor range with a door in the down range area should be equipped with an alarm. The door could also be secured

by a mortise lock or barred from within, but should remain a fire exit. Fire codes generally prohibit bars on doors that would delay escape from a building.

- 4.04.3.2 Target carriers are primarily used for the convenience of shooters to allow them to continue shooting without delay when target changes are necessary. For indoor ranges where competitions will be conducted target carriers and turning target mechanisms are a definite plus. From a health standpoint, target carriers serve to keep shooters out of the "high lead concentration" areas and safely behind the firing line. Target carriers are commercially available, see Reference section, in the Appendix.
- 4.04.3.3 Install heating units behind and above the firing position to provide a comfort zone for the shooter and protect the heating units.
- 4.04.3.4 Gunracks mounted along the walls behind the firing positions are an added safety feature. They reduce gun handling and serve to keep range areas orderly.
 - a. Material: Soft pine shelving lumber.
 - b. Design: Build gunracks using half moon cutouts and soft padding. For pistols, shelves above rifle racks provide the best use of space.
 - c. Size: Depending on range use, racks should provide ample room for all shooters. Cramped space can foster accidents, such as tripping over a pistol box or rifle.

4.05 Optional Features

- 4.05.1 A suitable lounge area provides comfort and adds a greater degree of control for range officers. It also separates spectators from uncased firearms.
- 4.05.2 Provide receptacles for trash and spent shell casings. Spent shell casings represent potential revenues for range operations and should be kept separate. Keeping the range clean prevents accidental falls and reduces lead dust. Also provide a container for disposal of misfire or dud cartridges.
- 4.05.3 Coat racks are a good addition, especially in the winter months. Keep coat racks outside the range areas to keep them free of lead dust.
- 4.05.4 Special vacuum cleaners, meeting Occupational Safety and Health Administration (OSHA) specifications for dust removal are suggested to protect workers and to preserve air quality. **CAUTION: DO NOT** use regular household or shop vacuum cleaners.
- 4.05.5 Design or modify the indoor range to include restrooms.

ARTICLE 5. APPENDIX

5.01 Site Evaluation Questionnaire and Appraisal

- 5.01.1 The following questionnaire is a guide to determining if a site is suitable for constructing either an indoor or outdoor shooting range. Bear in mind that certain legal restrictions may dictate where the facility may be located, so it is advisable to consult with an attorney.
i.e. [>, greater than; <, less than]

Access:	Dedicated right-of-way	[]
	Trail	[]
	Logging road	[]
	Dirt road	[]
	Gravel road (All weather)	[]
	Paved road	[]
Travel Distance for shooters:	> 0 < 10 miles	[]
	> 10 < 20 miles	[]
	> 20 < 30 miles	[]
	> 30 miles	[]
Utilities Available:	Electricity	[]
	Phone	[]
	Water	[]
	Natural Gas	[]
	Sanitary Sewer	[]
Local Habitation	< ½ mile	[]
	> ½ mile < one mile	[]
	> one mile < two miles	[]
	> two miles	[]
Other land uses:	Hunting	[]
	Hiking	[]
	Horse Trails	[]
	Parks	[]
	Other	[]
	None	[]
Vegetation:	Cleared	[]
	Scrub brush	[]
	Light timber	[]
	Heavy timber	[]
Size:	< 10 acres	[]
	> 10 acres < 20 acres	[]
	> 20 acres < 50 acres	[]
	> 50 acres < 100 acres	[]
	> 100 acres	[]
Area Geology:	Clay	[]

	Sand	[]
	Heavy rock, i.e.,	[]
	Swamp	[]
	Other	[]
Topography:	Desert	[]
	Plains	[]
	Hilly	[]
	Mountainous	[]
	Flood Plain	[]
In Proposed Impact area:	Lakes	[]
	Ponds	[]
	Rivers	[]
Weather:	Dry []; Semi-Dry []; Wet []; High Winds [];	
	Heavy Snows []; other [] (please list)	

Zoning*: RR 1 [] RR 2 [] C-1 [] C-2 [] Agriculture [] Conservation [] Recreational []

Ownership: Private [] County [] State [] or Federal []

* (RR-1 = Rural Residential single family homes, RR-2 = Multi-family dwellings, C-1 = light industrial, C-2 = heavy industrial and the remaining three are self explanatory.)

Note: Zoning designations will vary to some degree in each zoning jurisdiction. You are strongly advised to engage a local attorney, licensed to practice law in your state, familiar with zoning laws to advise you in regard to the zoning regulations in your particular jurisdiction.

5.01.2 Considerations for construction of an indoor range.

5.01.2.1 Use of an existing building.

- a. In the event original drawings of the building are not available make a sketch of each floor of the building with special emphasis on load bearing walls.
- b. Identify type of exterior wall construction. Masonry [], Wood [], Concrete [], Metal [], Combination [], Other []. Walls, ceilings and floors must be capable of containing any bullet fired in the range area as well as sound. The ideal wall is made of poured concrete a minimum of 6 inches thick with rough porous interior surfaces, which may be further treated with sound absorbing materials. Finish concrete floors to have a non-porous surface. This will aid in range cleaning. Ceilings should be a suggested height of 8 feet and enclosed to reduce air turbulence created by ventilation systems. Existing buildings often require extensive modification often exceeding the costs of new construction; however, certain building types can be used to good advantage, such as warehouse buildings, abandoned bowling alleys, etc.
- c. Evaluate structural support designs of older buildings from the standpoint of the ability to withstand new loading. Original design considerations usually do not allow for installing

heavy backstops and other range equipment. To decide if modifications are necessary, analyze slab buildings carefully to determine the capacity for floor loading. Original plans

and design specifications are the best source of determining the composition of the floor and footings. In some instances, the entire slab may need replacement, while in others only the portion underneath the backstop area will need to be replaced. Where floor drains do not exist, modifications should include one or more if economically feasible.

- d. Electrical wiring will usually require the removal of small wiring and its replacement with heavy duty wiring both internally and externally to accommodate the added power needs for range ventilation, heating, lighting and target carrier mechanisms. In most areas, this work calls for electrical permits that a licensed electrician obtains.
- e. Plumbing doesn't usually require any major modifications; however, heavy metals may be prohibited by area wastewater treatment collection systems. Therefore, the use of a dry well system or on-site septic systems may be necessary for disposal of what may be determined as hazardous waste material, i.e., lead. In any event, it is critical that local restrictions be reviewed for compliance.
- f. Ceiling joists will usually require strengthening to support baffles and shielding material.

5.01.2.2 New Construction

- a. New indoor construction projects require the same guidelines as existing buildings, but have the advantage of building a structure especially for a range. The advantages are discussed more fully in Section III - Indoor Ranges.

5.02 Shotfall Zones

- 5.02.1 Shotfall zones for shotgun ranges are also based on maximum ranges of shot and will vary according to shot size, therefore, most shotgun ranges restrict shot size to sizes no larger than No. 7 ½, with the exception that larger shot may be used when patterning a shotgun. Maximum ranges according to the Journée' formula shown in Chart B under 3.02.2.2 provides a guide for range layout work. More information covering shotfall zones are provided in Section II - Outdoor Ranges. It is pointed out that Journée's formula does not hold true for steel shot of the same dimension. Various factors can affect the maximum distance that a bullet or shot may travel. The tables below are to be considered as guidelines only. This Source book does not represent or guarantee that a particular bullet or shot may not travel further than the below stated distances. Remember that you will most likely be held responsible for the damage or injury caused from any bullet or shot that escapes the shooting range, no matter what the distance that the bullet or shot traveled.

5.03 Firing Positions (Indoor and Outdoor)

6.03.1 Firing point/position dimensions:

Range Type	Suggested		Minimum	
	Width	Length	Width	Length
Smallbore (.22 rimfire)	5 ft.	7 ft.	4 ft.	7 ft.
High Power Rifle	6 ft.	12 ft.	6 ft.	7 ft.
Muzzleloading	7 ft.	6 ft.	7 ft.	6 ft.

Pistol	4 ft.	4 ft.	3 ft.	3 ft.
Air Gun	4 ft.	6 ft.	4 ft.	5 ft.
Shotgun	3 ft.	3 ft.	3 ft.	3 ft.
Archery	6 ft.	4 ft.	5 ft.	4 ft.

Note: For competitive events firing point/position dimensions are specified in the appropriate rule book under 6.0 Range Standards, and are provided in each technical chapter of this source book.

- 5.03.2 Firing positions should be numbered to correspond with each target to avoid confusion. Markers, readily identifiable, should be set or painted at the left front corner of each position running in a left to right ascending order. Additional space behind and along the firing line area must be allowed for range officers, scorers, etc.
- 5.03.3 For detailed information on what has been discussed in this chapter see the appropriate technical chapter.

THE RANGE SOURCE BOOK

SECTION ONE

CHAPTER SIX

SOUND ABATEMENT ON SHOOTING RANGES

National Rifle Association
Range Department
11/99

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ARTICLE 1. GENERAL

Portions reprinted from *Sound Abatement Techniques and Defending Yourself Against Noise Complaints* by Scott Hansen, Consultant.

1.01 Purpose

- 1.01.1 The purpose of this chapter is to provide a better understanding of the environmental issue of sound or "noise" pollution. Sound will be discussed as it relates to small arms shooting ranges, using a minimum of technical language and complex mathematical formulae.

1.02 Introduction

- 1.02.1 In the past few years, public recognition of sound and how it affects the public has prompted noise abatement programs for all sources of sound. Noise from a variety of sources has been found to reduce the quality of one's life. Prolonged exposure to high levels of sound without hearing protection can result in permanent hearing loss. OSHA -- the Occupational Safety and Health Administration -- has determined that a sound level of 90 dBA is the threshold for hearing conservation programs. Because firearms easily exceed this level of sound, users must wear hearing protection.
- 1.02.2 Today, regulations control sound emissions of most outdoor activities. When examining recreational activities, many of the regulations from federal agencies are not actively enforced. Therefore, state and local laws have been enacted which place great emphasis on community noise from industrial and recreational activities.
- 1.02.3 Shooting ranges reproduce high levels of sound. Sound waves often travel beyond the boundaries of the range property. Escaping sound waves may be perceived as unwanted community noise by neighboring property owners. Remote areas, away from housing developments, etc., no longer exist the way they did 40 years ago. In those rare situations where they do exist, time and distance often detract shooters from using these facilities. It is important for range owners and operators to work with the local zoning board. Shooting ranges should be highlighted as *noise parks*. This designation should make the ranges visible to zoning planners and developers prior to developing neighboring properties. Range owners/operators should implement sound abatement programs into their yearly planning. These noise plans must actively pursue the goal of a sound abatement plan: preventing conflict before it occurs. These plans may entail contacting an acoustical consultant, not three days before a board of zoning hearing, but before a problem develops. This consultation may be prior to the opening of a new range, or at the beginning of the shooting season. Sound levels should be taken at the property lines during normal operation of the range, such as during competitions of day-to-day activity. These documented evaluations will be compared to future levels as changes are made to and around the range. The evaluations will also determine if the range satisfies local sound laws.
- 1.02.4 Sound abatement planning also allows range layouts to change and gives the range design team the flexibility to change locations, directions, and entire sites if necessary.
 - 1.02.4.1 Developing good public relations with the range neighbors and community at large is essential. Show the community that you are bringing in money when people visit your facility and subsequently patronize sporting goods shops, hotels, and restaurants. Some ranges have made deals with these types of businesses during weekend shooting events. There are many other examples of good public relations which will be discussed by others. If you show that you are a valuable community asset, the community is more likely to support you.

ARTICLE 2. DEFINITIONS

- 2.00 The following definitions will help the layman understand some of the technical terms used by engineers and others who practice in the field of acoustics, and are not an attempt to teach the reader to be an acoustical expert. It provides only the essential elements of sound and a general description of when sound becomes "noise".

2.01 Sound

- 2.01.1 To develop a complete description of the sound generated by gunfire, consultants measure and describe its frequency spectrum, its overall sound pressure level (SPL), and the variation of both of these quantities with time. Michael Rettinger, consultant on acoustics, in his book Acoustic Design and Noise Control, Volume II, describes sound, "Like a wafted kiss, sound is both a physical phenomenon and a subjective sensation." In the former sense, either a form of mechanical energy or a variation in pressure or stress, it will be called a "sound wave" for ready identification. Sound is the stimulus for hearing, even though not all sounds are audible to the human ear. Sound waves behave like ripples on a pond after someone throws a rock into it. The object thrown becomes the sound source, the ripples the sound pressure waves. In the pond we see a two-dimensional pattern of circular waves, but in the atmosphere sound waves are three-dimensional, spherical and far more complex.

2.02 Noise

- 2.02.1 Wyle Laboratories defines noise, in a publication produced for the EPA as: "Whenever unwanted sounds intrude into our environment, noise exists." An example is when someone is resting or asleep and has sleep interrupted by a neighbor mowing a lawn. To the person mowing the lawn, the sound generated by the mower is necessary and therefore unobtrusive. To the one trying to sleep, it's noise.

2.03 Terms

Absorption Coefficient: The fraction of incident sound not reflected by a surface. Values range from 0.01 for marble slate, to 1.0 for absorbent wedges used in anechoic rooms.

Acoustics: 1. The study of sound, including its generation, transmission, and effect. 2. The properties of such areas as rooms and theaters, which have to do with how clearly sounds are transmitted and heard in it.

Ambient Noise: The totality of noise in a given place and time. It is usually a composite of sounds from varying sources at varying distances. Also see residual noise.

A-Weighted Sound Level (La): Sound pressure level, filtered or weighted to reduce the influences of the low and high frequency noise. It was designed to approximate the response of the human ear. Noise is measured on a dBA scale. Small arms fire is generally measured on the A weighted scale and impulse response mode.

Background Noise: The total noise in a situation or system except the sound that is desired or needed.

Baffle: A shielding structure or series of partitions which reduces noise by lengthening the path of sound transmission between source and receiver.

Daytime: The hours between 7am and 7pm.

Decibel (dB): In layman's terms, the unit used to measure the relative loudness or level of a sound. The range of human hearing is from about 0 decibels to about 140 decibels.

Evening: The hours between 7pm and 10pm.

Impulsive Sound: Noise with an abrupt onset, high intensity, short duration typically less than one second and often rapid changing spectral composition.

Inverse Square Law: The law describing the situation in which the mean square sound pressure changes in inverse proportion to the square of the distance from the source. Under this condition the sound pressure level decreases six decibels for each doubling of the distance from the source

L(eq) energy equivalent sound level (Leq): Is a measure which describes with a single number the sound level of a fluctuating noise environment over a time period. It is a sound level based on the arithmetic average energy content of the sound.

L(dn): is the Leq (energy averaged sound level) over a 24-hour period. It is adjusted to include a 10 dB penalty for noise occurring during the nighttime hours (10 pm to 7 am). Weight is given to nighttime noise in this way to account for the lower tolerance of people to noise at night.

Microphone: An electroacoustical transducer that responds to sound waves and delivers essentially equivalent electric waves.

Nighttime: The hours between 10pm and 7am.

Noise: Any unwanted sound, and by extension, any unwanted disturbance within the frequency band.

Noise Contour: A continuous line on a map of the area around the noise source connecting all points of the same noise exposure level.

Noise Level Reduction: The amount of noise level reduction achieved through the incorporation of noise attenuation in the design and construction of the structure.

Peak Sound Pressure: The maximum instantaneous sound pressure (a) for a transient or impulsive sound of short duration, or (b) in a specific time interval for a sound of long duration.

Reflection: The throwing back of an image, of the original sound, by a surface.

Refraction: The bending of a sound wave from its original path, either because of passing from one medium to another or because (in air) of a temperature or wind gradient.

Residual Noise Level (ambient): The residual noise level is the level of the unidentifiable noise which remain after eliminating all identifiable noises. For this chapter, L90 has been used as an

estimate of the residual (ambient) noise level when no steady state identifiable noises are known to be present.

Shielding: Attenuating the sound by placing walls, buildings or other barriers between the sound source and the receiver.

Sound Level: The weighted sound pressure level obtained by use of a sound level meter having standard frequency-filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, comprising of a microphone, an amplifier, an output meter, and frequency-weighting networks. Sound level meters are used for the measurement of noise and sound levels in a specific manner.

Sound Pressure: (1) The minute fluctuations in the atmospheric pressure which accompany the passage of a sound wave. The pressure fluctuations on the tympanic membrane are transmitted to the inner ear and give rise to the sensation of audible sound. (2) For steady sound, the value of the sound pressure averaged over a period time.

Sound Pressure Level (SPL): In dB, is 20 times the logarithm to the base 10 of the ratio of the pressure of this sound to the reference pressure. The reference pressure shall be explicitly stated.

The following reference pressures commonly used are:

- (1) 20 micropascals (2x.0001 microbar)[20 micronewton/meter squared]
- (2) 1 microbar
- (3) 1 pascal

Sound Transmission Coefficient: The ratio of transmitted to incident energy flux at a discontinuity in a transmission medium.

Sound Transmission Loss (TL): A measure of sound insulation provided by a structural configuration. Expressed in decibels, it is ten times the logarithm to the base ten of the reciprocal of the sound transmission coefficient of the configuration.

Yearly Day-Night Average Sound Levels (DNL): The 24-hour average sound level, in decibels, for the period from midnight to midnight. Day night averages are obtained after the addition of ten decibels to sound levels for the periods between midnight and 7 am and between 10 pm and midnight, local time, as averaged over a span of one year. It is the standard metric of the Federal Aviation Administration for determining the cumulative exposure of individuals to noise.

ARTICLE 3. CONCEPTS AND METHODOLOGY

3.01 Concepts

- 3.01.1 The National Rifle Association has developed the information in this chapter to provide a general discussion on sound, its potential effects and sound abatement technologies suited for use on ranges. This will be helpful to ranges which may be required to install sound abatement materials or where future land use criteria deems it necessary. The information pertains to outdoor ranges more than indoor ranges.
- 3.01.1.1 Any observer may or may not consider "sound" generated by a given source to be "noise". Therefore, in most recreational activities, especially with small arms, planners of ranges must consider what effect sounds generated will have on the nearby environment.
- 3.01.1.2 "Noise" exposure is the integrated effect, over a given period of a number of different sound levels and durations. The integration also includes specific weighting factors for the events during certain time periods in which sound affects the environment more severely, such as when people are trying to sleep. The national quiet time is considered to be between 10pm and 7am. The various scales for "noise" exposure in use throughout the country differ by the methods of integration or summation, time period weighting factors and frequency weightings.
- 3.01.1.3 That certain types of noise can affect human health and safety is well documented. Adverse effects depend on their loudness and frequency spectrum. Generally, sounds generated on ranges will have little, if any, effect on the physical or psychological health of inhabitants of the surrounding area. Where they do, it is noted for inclusion in a "noise" plan.
- 3.01.1.4 From the first planning meeting to the last nail driven during construction, it is important that the master plan include a sound mitigation program. Failure to adopt such a plan can result in financial losses for the range owners or operators, or the termination of an otherwise quality range operation. Where once there was nothing for miles, clubs are waking up and finding that housing developments are moving in with little if any response time. Therefore for existing ranges it is wise to develop a noise mitigation program within its long range plan.
- (1) Develop concepts and methods to abate sound for eventual use on planned ranges. Although the physics of sound is the same everywhere, each range will be different from others. Methods that will work for one may not be suitable for another.
 - (2) Conduct research on materials that may be suitable for use on a particular type range such as benchrest, pistol, smallbore or highpower. Specific applications can then be determined.
 - (3) Develop specifics on:
 - a. Terrain features
 - b. Soil and surface geology characteristics
 - c. Hydrology and vegetation
 - d. Existing land uses and utilities
 - e. Population densities
 - f. Other environmental considerations, such as air quality, prevailing wind conditions, temperature changes, and humidity fluctuations

3.02 Land Use Determinants

3.02.1 Master Plan

- 3.02.1.1 Developing a master plan for a specific site may seem to be a lot of unnecessary work in some cases, but it's smart planning. The master plan outlines sound abatement technology and involves a study of the following:
- (1) Any sound abatement program must meet the standards of existing regulations, ordinances or laws. In most instances existing laws will specify a sound level for a particular land use. To determine if the facility will meet the standards, measurements must be taken to determine what if anything must be done to mitigate any problem. Sound level measurements for small arms will use the fast or impulse detector response mode as identified on a Precision Integrating Sound Level Meter and Analyzer. Sound measuring devices must meet ANSI standards and have a factory calibration date within one year of the date when testing is to be conducted. All meters used for testing must be designed to allow for field calibration with field calibrators having a factory calibration certificate validated each year.
 - (2) A complete description of the proposed site and surrounding areas including site maps to aid in determining if the land use is compatible with current and projected land uses around the proposed site. In addition, it is advisable to conduct an environmental analysis, a part of which would be the development of a "noise" profile as discussed in this chapter. (See Section I, Chapter 3, Paragraph 2.14 for guidance and procedures for conducting an environmental analysis.)
 - (3) A study of the economic impact the proposed range will have on the area surrounding or in close proximity to the proposed site.
 - (4) A complete description of the range facility including detailed drawings. Have a consultant draw a "noise" profile overlay and include it in the sound abatement program. Include in this portion of the document solutions to the identified existing or potential problems. How much will they cost? How effective will they be? Are they politically and socially possible?
 - (5) A complete description of the community and neighboring properties. Include: existing use, planned use, safety, and other environmental considerations.
 - (6) A sound survey of the area. This will provide information on which future plans will hinge. It will also provide a vehicle whereby public input can be obtained towards the construction of a project. It will also provide time to educate the community on the benefits of the project. Where results of these surveys show significant public opposition may exist, the master plan must include sound abatement strategies that will answer opposing arguments.

3.03 Land Use Compatibility

3.03.1 Area

- 3.03.1.1 Land use as it relates to existing conditions is but one facet of the study and is directly linked to what future conditions may exist at a site. Regulation of land use in some areas is so stringent that any other than what already exists may be rejected. When a range locates in an area the one factor seldom considered, is the community and its role as a regulatory body. Should a noise complaint arise as a result of range operations and the proper approvals have been received, the noise problem is no longer a problem the range facility must face alone. The community must also become involved and assist in resolving the conflict. In other instances, even with full knowledge of the presence of a range, adjoining parcels have been rezoned for new housing developments, giving little, if any, forethought to future consequences.
- 3.03.1.2 One of the primary yet often overlooked considerations in developing a range project is the economic impact the facility will have on the community. How it effects the community should

it locate nearby, or if it is forced to move to another site are critical issues. Local economies are important. Even though shooting is a recreational activity, the range becomes part of the local business community. Outside activities, such as tournaments, bring outside money into the economy thereby playing an important political role in the local community. Most range operators do not give the economic impact a range can have on a local area sufficient consideration. Major tournaments, will not only draw hundreds of individuals into an area, but will also attract new revenues.

3.03.2 Existing Conditions

3.03.2.1 What are the existing conditions at the proposed or existing site? Study the environment to determine what impact is occurring. This is the reason an environmental analysis (EA) is necessary. Conducting an EA requires a thorough review to determine if there is any reason to implement a major and costly sound abatement program. It requires a complete description of what may or may not occur if the range is built. (See Section I, Chap. 3, paragraph 2.14 for guidance and procedures for conducting an environmental analysis.)

3.03.3 Future Conditions

3.03.3.1 As a general guide, the following categories were developed by the NRA based on field and text book work:

- (1) Unacceptable: If the sound level exceeds 90 dB(A) for 1 hour out of 24 or exceeds 85 dB(A) for 8 hours out of 24 and the receiver is less than 1/4 mile from the sound source.
- (2) Discretionary: Normally Acceptable, if the level exceeds 80 dB(A) for 8 hours out of 24 or if there are "loud" impulsive sounds (referring to sonic booms, artillery, etc.) on site and the distance from the property boundary and the receiver is one mile or more.
- (3) Discretionary: Normally acceptable if the level does not exceed 75 dB(A) at the property boundary more than 6 hours out of 24 hours and distance from the boundary line and the receiver is over 1/2 mile.
- (4) Acceptable: If the sound levels at the receiver do not exceed 65 dB(A) more than 8 hours out of 24 or activities do not extend into the nighttime hours of 10pm through 7am.

Active shooting is to take place during the daytime hours of 7am 10pm, with curtailed, but not necessarily discontinued activities during evening hours of 7pm - 10 pm. Shooting activities should not continue into nighttime hours, 10pm - 7am.

3.03.4 Regulatory Controls

3.03.4.1 Governmental planning organizations offer services to local agencies to assist them in developing goals and policies for community "noise" control. They also provide general land use, environmental protection and open space recommendations. In July 1981, the U.S. Environmental Protection Agency developed a Community Noise Assessment Program designed to assist communities to assess, control and improve their noise environment. Even though this document focuses on larger more densely populated areas, it does provide some valuable tips for the range planner. For example, they define assessment tools to be similar to those provided in this chapter for site evaluation purposes for both existing and proposed range facilities.

3.03.4.2 A number of states have laws relating to noise. Most of these noise laws are concerned with motor vehicle, snowmobile, or boating sounds. A few, such as New Jersey, Illinois, and Connecticut, have very clear noise laws relating to impulse sounds. Some laws include definitive methods for measuring the sound, and clearly defined acceptable levels. Others are very vague.

Connecticut, for example, states that "no one shall cause or allow the emission of impulse noise in excess of 80 dB peak sound pressure levels during the nighttime to any Class A Noise Zone." Peak sound pressure level, L_{peak} , means the absolute maximum value of the instantaneous sound pressure level occurring in a specified period of time. The noise laws of Illinois, on the other hand, use maximum levels. Maximum sound pressure level, L_{max} , is defined as the maximum root mean square value of the instantaneous sound pressure level 61 dBA, depending on time of day and the class of neighboring property. These different state laws, like local laws, vary greatly. It is important for range developers/operators to be familiar with the requirements and restrictions of laws applicable to their facilities.

3.03.5 The Community and its Role

- a. Develop a noise control program and goals.
- b. Develop details of an acoustical survey, before, during and after.
- c. Develop details for an attitudinal survey.
- d. Gather existing complaint data.
- e. Present the program design, and its implementation costs.
- f. Make noise measurements. The standard criteria to be used when taking noise measurements are:
 - (1) At the property line, and in direct line with the receiver.
 - (2) Select measuring points that are clear of interfering objects (other than naturally occurring ones such as trees) or terrain.
 - (3) Describe the surface area over which the sound travels. Certain surface area configurations, such as a good grass cover affects the rate of decay for sound. The intervening distance between a point source and a receiver is also an attenuating factor. As a rule, each time the distance is doubled the sound pressure level is reduced by one-half, or reduced by about 6 dB. Take note of any walls, buildings, signs, people or other barriers normally between the point source and the measuring point. These obstacles serve also to attenuate the sound pressure levels. A hard surface does not add much to attenuation but distance, thick grass and heavy shrubbery do. Significant terrain features are also important, for example a noise source in a depression is provided barriers that will redirect sound and is not as serious as one at a higher elevation. Therefore, a range located in a valley presents less of a problem than one at the same general elevation as the surrounding area. Ranges elevated above a receiver will have the advantage of atmospheric attenuation, with additional components attenuated via wind. Atmospheric and wind attenuation is a function of temperature, wind speed, humidity and frequency.

Atmospheric attenuation has a greater effect on high frequencies such as the supersonic crack of a bullet. Wind and temperature together affect propagation of sound in a variety of ways, but one of the more important is called a temperature inversion, but are normally directional. A wind gradient tends to cause a sound wave traveling with the wind to slope or bend toward the ground and appear to be louder. A sound wave traveling against the wind will bend upward and away from the earth, hence developing a sound shadow very near the source. This is one reason it is difficult to hear upwind from a source. Another reason is the masking effect of wind noise around the ears.

- (4) Note noise reflecting off surface areas, such as trees, bodies of water, overhead firing line covers, hillsides, hard surfaces such as pavement can have a marked affect as well.

Information needed on the field data sheet should include:

- a. The time the receiving property is occupied.
- b. What are the characteristics of the home?
 1. Is it air conditioned?
 2. Do they have a stereo?
 3. Is the room most used in the house closest to the range?
 4. Are there large pane windows facing the range?
 5. How thick are the walls?
 6. Is the house insulated?
 7. The elevation of the house in relation to the range?
- c. Conduct attitudinal survey
- d. Review complaint data
- e. Review noise survey results. A review of the survey results will now permit a fuller understanding of the situation. Once the data collection is complete, break it down into categories for analysis.

There are three sources for solutions to a noise problem. (1)What the range can do to abate sound levels over what existing laws allow, (2) measures available to the complainant, and (3) the role of the community in the matter.

- f. Apply strategy analysis for development of "noise" abatement alternatives.
- g. Compile alternatives and recommendations for "noise" abatement.

3.03.6 Government

3.03.6.1 County: In many jurisdictions, the county will be the governing agency. County planning boards assist in planning general land use and often develop long range plans. These plans are helpful in determining how future development will impact a planned range.

3.03.6.1.2 State: In most instances, states rely on the county and local agencies. However, in some instances, state agencies will have jurisdiction.

3.03.7 Populations

3.03.7.1 Information on population characteristics such as density, growth rates for previous periods and projected future growth rates also provide valuable information. A range builder can use this data to determine how growth rates will add or detract from the proposed facility. Population growth provides additional resources for the properly sited facility, and potential problems of encroachment for an improperly sited one.

3.03.8 Noise profiles

- 3.03.8.1 During the site selection process, have a consultant develop a sound "noise" profile for each proposed site to determine what abatement procedures, if any, will be needed on each. Remoteness has, in the past, been the accepted norm used to select a site. By using modern technological advances in acoustical materials, outdoor ranges can be sited near population centers. Developing a noise profile requires the services of an engineer practicing in the field of acoustics or someone thoroughly familiar with sound testing equipment and sound abatement methodologies.

3.03.9 General considerations

- 3.03.9.1 Cooperation with other range operations, community groups, educational institutions, recreational related organizations and others can gain needed support when justification is being put together. Early cooperation will show other groups how the facility will benefit the local community. In many instances, this aspect is omitted. How a particular operation will affect the local economy is important and necessary to counter any negative input. This balanced with how the facility will impact the local environment is also important.

3.03.10 Noise Abatement Programs

- 3.03.10.1 Noise abatement programs are necessary on all ranges from the standpoint of the user. Hearing protection should be a requirement for all users who are within 50 feet of the firing line.
- 3.03.10.2 Sound abatement shields or barriers should be installed on ranges where neighbors are within 1/4 mile of the facility unless significant natural barriers exist. Any fixtures or terrain features must serve either to redirect or capture sound. Exact configurations depend upon site characteristics.

3.03.11 Noise Measurement Standards

- 3.03.11.1 Select equipment based on the following:
- (1) Must meet all ANSI specifications.
 - (2) Select multi-directional microphones.
 - (3) Position microphones 4-5 feet above the ground on a tripod.
 - (4) Select test sites at property boundaries or according to existing statutes.
 - (5) Use a wind screen in all outdoor conditions.
 - (6) Average wind speeds must be less than 12 mph. (Wind noise at higher speeds will invalidate data.)
 - (7) Set sound level meter on tripod or stand and use a 5 foot extension for the microphone. (Use an extension on the microphone when necessary.)
 - (8) Calibrate sound level meter and other recording devices before, during (every hour) and after sampling.
 - (9) Have equipment factory calibrated once each year.

3.04 Selection of Sound Abatement Applications

- 3.04.1 The only way to prevent all sound from escaping the range property is to encapsulate it in an airtight enclosure. Sound levels can, however, be significantly reduced through good design. Sound usually travels from the source to the receiver via multiple paths, e.g., direct and reflected paths. By blocking line of sight, propagation paths, or the direct path from the firearms to the receiver, the major component of the sound is minimized. However, diffraction, refraction, the

bending of sound waves, and reflection of sound waves will still allow sound to propagate to the receiver.

- 3.04.2 What are some practical examples of noise control on outdoor ranges? The most common type of sound abatement used on shooting ranges is barriers. Since a firing line cover provides shelter for the shooters, it is a common starting point in noise control. Across the country, cover designs vary greatly. They range in height from 7 to 15 feet. Some have flat roofs, some slanted, and others gabled. Many are made with 4x4 posts, while others use metal poles or I-beams. Roofing materials range from corrugated metal to a full wooden-shingle construction. Corrugated metal roofs have a limited number of attachment points and are very resonant. This means that the material is likely to ring when excited, either by a stone hitting it or a pressure pulse from discharging firearms. A more damped firing line cover made from typical roof material, e.g., wood and shingles, is desirable.
- 3.04.3 To eliminate the direct source-to-receiver path of noise, construct a barrier, berm, or wall. To eliminate the direct path to this side of the range, another barrier should be constructed extending from the back wall forward 10 - 20 feet beyond the firing line, or long enough to block the line of sight from the other end of the firing line to the concerned receiver. These walls should be physically coupled to the firing line cover, if possible. If cracks exist between these two structures, sound will be able to propagate away from the range in those directions. The mass of the barrier is also critical. The more massive the wall, the better the transmission loss will be, i.e., more sound reduction. There are many references which provide acoustic properties of materials. One example is a book by Beranek (*Acoustics*, Am. Inst. Phys., New York, 1988). Figure 10.27 of this book shows pictorially the average transmission losses of different wall construction. For example, the average transmission loss of a ½ inch fiberboard on 2x4 studs is about 31dB. A single sheet of ½ inch plywood yields an average transmission loss of about 22dB. These are excellent references one can use when constructing wall-type barriers.
- 3.04.4 The effect of enclosing a range with barriers is to direct all of the sound from the firearms in the forward direction and away from the noise-sensitive area. Sound will still propagate to the neighboring community due to diffraction and reflections from downrange obstacles, e.g., the hillside, berms, and trees. Insulation added to the walls and ceiling of the firing line cover will reduce the impact of the sound reflected onto the shooter or range user. Insulation will also help reduce the sound pressure levels being projected forward of the firing line area by absorbing the sound energy instead of reflecting it. Insulation can be added to the firing line cover in many forms. Attaching batting to the underside of the firing line cover, using blown-in insulation, or installing a drop ceiling with attaching insulation board have all been used successfully on shooting ranges.
- 3.04.5 Another solution to fixed point firing ranges is the tube range. This design consists of one or two sections of 36 inch or greater class III drain pipe. The pipe should be concrete -- not metal. Metal pipes tend to ring loudly even when partially buried in the ground. The ends of the tube are capped; these caps are typically made of plywood with holes cut into each cap just large enough to handle the firearm and have an unobstructed view of the targets. In this manner, the tube acts like a large silencer. Some tube designs include internal baffles to break-up the sound waves as they propagate down the tube. This design is generally used for benchrest shooting only. Three-position shooting is possible on this type range if trenches are dug at the front of the tube and adjustable platforms constructed for other positions.
- 3.04.6 The Discussion so far has concentrated on fixed position shooting. What about shotgun ranges where the targets can vary 180° horizontally and vertically? Barriers can be utilized in some

situations with limited success. Because of the movement of the firearm, enclosing the range is difficult. For example, an enclosed trap or skeet range is not commonplace but could be done in a dome-like structure. For these situations, landscaping appears to be the only solution. Sound control by landscaping employs three processes: ground impedance, natural barriers, and to a lesser extent, increasing the noise of the environment.

- 3.04.7 Cook and Haverbeke (*Tree and Shrubs for Noise Abatement*, Nebraska Agricultural Experimental Station Research Bulletin\#246, July 1971, CN: DNAL 100-N27-(3)) studied the effect trees and other forms of vegetation had on transmission of sound. They planted trees and shrubs in the form of shelter belts and wind-breaks, and measured sound levels of traffic noise and pure tones. They found that 65-100 foot wide stands of dense trees and shrubs are needed to reduce noise. For optimum results, the trees should be close to the source as opposed to close to the receiver. Trees, with uniform vertical foliage, should be planted as close as possible to form a continuous, dense barrier. Sparsely-planted trees offer little resistance to propagating sound. Where year-round screen is desired, evergreens or deciduous varieties which maintain their leaves are recommended.

THE RANGE SOURCE BOOK

SECTION THREE

CHAPTER ONE

GENERAL INDOOR RANGE INFORMATION

**National Rifle Association
Range Department
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ARTICLE 1. GENERAL

1.01 Purpose

- 1.01.1 This chapter provides range planners with information on how indoor ranges are built. Information includes the advantages and some disadvantages of building an indoor range. Before the decision to build an indoor range is made, all factors must be included in the decision-making process. For example, in some areas regulations covering environmental pollution, coupled with urban sprawl and the lack of open spaces for outdoor shooting facilities, have created a shift toward the construction of indoor ranges. Indoor ranges, unlike outdoor facilities, offer a totally controlled shooting environment, eliminating difficulties with bullet containment and sound which affect outdoor ranges. In addition, planners must communicate with the public sector, for too often past practices have been inadequate. Range developers must provide permit authorities with adequate information on the project, how it is designed, how it will be used and how it will benefit the community.
- 1.01.2 Nothing in the information that follows should be considered as "requirements" or "standards" of NRA. The informational items provided are suggested "guidelines." A range designer, owner, or operator may, or may not choose to act on any or all of these guidelines. It should not be interpreted by anyone that a failure to accept and /or implement any of the guidelines set forth herein is evidence of a "cavalier attitude" regarding health and/or safety. A range operation may otherwise be very safety and health conscious without having to conform to all of these suggested guidelines.

1.02 Cross Reference

- (a) General Information, Section I, Chapter 1
- (b) Safety Plan, Section I, Chapter 2
- (c) Planning and Design, Section I, Chapter 3

ARTICLE 2. GENERAL INDOOR INFORMATION

2.01 Introduction

- 2.01.1 Design considerations for an indoor range must include. (1) impenetrable walls, floor and ceiling; (2) adequate ventilation (3) lighting to approximate near daylight conditions; (4) sufficient space and (5) acoustical treatment for sound attenuation.
- 2.01.2 Factors that may lead to an unsafe operation are:
 - (1) Incompatibility of use with original design
 - (2) Change of use without appropriate modification
- 2.01.2.1 The range must be used according to its original purposes. Sometimes, facilities are used in a manner inconsistent with the original design. To prevent this, establish a program that will explain why rules must be followed. In addition, range use criteria should be distributed to each user, with a requirement that a document be signed stating he/she understands and will comply with the stated rules.

2.02 Planning Overview

- 2.02.1 A well thought-out plan takes into consideration:
 - (1) Essentials
 - (2) Desirables
 - (3) Alternatives, to include advantages and disadvantages
- 2.02.1.1 This plan should be written, spelling out what each aspect must accomplish. In addition, list all desirables and then alternatives, including the advantages and disadvantages. Only then can the decision-making process be done correctly. By setting up a systematic plan, mistakes will be minimized.

2.03 General Information

- 2.03.1 Indoor range construction projects generally require the same approach as outdoor ranges. Refer to Section I and II for: (1) General information planning and design; (2) Setting up a safety plan; (3) Organization and management and (4) Range operations and maintenance.

ARTICLE 3. SAFETY

3.01 Elements of the Plan

- (a) Rules
- (b) Physical Facilities
- (c) Training

- 3.01.1 Safety is affected by setting up control measures to which range users must adhere. These rules must be followed while handling firearms on an indoor range. Users must understand the rules of firearms-handling before live firing. Instructors or coaches provide additional help, thus enhancing the safety program.
- 3.01.2 Developing the safety plan includes the four E's -- evaluate, engineer, educate and enforce.
- 3.01.2.1 Evaluation determines what type indoor range will be constructed. The first step is to identify which firearms will be used, such as .38 caliber special, .22 caliber rimfire, .357 magnum, .45 ACP, .44 caliber magnum or a combination of calibers. Once this decision is made, the next step is to engineer or design. Design the facility to accommodate the planned activity. For highpower rifles, backstops must be capable of handling the higher velocity bullets. Do not design for pistol calibers and expect to use highpower rifles. The third step is to educate. Those who supervise or use the indoor range must be taught how the facility is to be used. They should understand the design and why any use outside its design limits is prohibited. For those who fail to abide by the rules, the final step is to enforce. To suspend privileges either temporarily or permanently. Rules are worthless without enforcement.

3.02 General Rules and Regulations

- 3.02.1 Designing and constructing an indoor shooting facility provides a workable facility for a planned activity. How it is used is of primary importance, for an indoor range is only as safe as the manner in which it is used.
- 3.02.2 The following gun handling rules are suggested for range safety plans.
- (1) Always keep the gun pointed in a safe direction.
 - (2) Always keep your finger off the trigger until ready to shoot.
 - (3) Always keep the gun unloaded until ready to use. On a firing range, this means being in position on the firing line and then loading for firing only after the range has been cleared for live fire.
 - (4) Know your target and what is beyond.
 - (5) Be sure the gun is safe to operate.
 - (6) Know how to use the gun safely.
 - (7) Use only the correct ammunition for your gun.
 - (8) Wear eye and ear protection as appropriate.
 - (9) Never use alcohol or drugs before or while shooting.
 - (10) Be aware that circumstances may require additional rule specifically for indoor ranges.
 - (11) Know and obey all range commands.
 - (12) Be alert for unexpected actions by other people.
 - (13) Shoot only at authorized targets in authorized frames or carriers.
 - (14) Designate a qualified range officer when none have been assigned.
 - (15) Open, unload and bench or ground all firearms during cease-fires.
 - (16) Do not handle firearms or stand at the firing line when others are down range.

- (15) Smoking, eating or drinking while on the firing line is prohibited.
- (16) Only those firearms for which the range has been designed will be allowed.
- (17) All firing will be done from designated firing lines or points.
- (18) No firing may be conducted closer than 50 feet from a backstop, unless the backstop is specifically designed to reduce backsplatter, or is modified with backsplatter shields such as curtains.
- (19) Each user is required to clean up the area after completing firing. Refuse and brass are to be placed in designated containers.

3.02.3 Cross Reference

- (a) General Range Commands, Section I, Chapter 2, Article 4

3.02.4 Range commands for each indoor facility may be abbreviated from those in NRA rulebooks, but should be considered part of the safety plan. Range commands should clearly and concisely inform shooters what to do and when to do it, ensuring smooth and safe operations.

ARTICLE 4. PLANNING AND DESIGN

4.01 Planning and Design Considerations

- 4.01.1 Planned use is the basis for design of indoor ranges. During the evaluation process, determine how the range will be used. Design work for ventilation, wall structures, floors, ceiling, acoustics, backstop and lighting hinge on that decision.
- 4.01.2 Regardless of the approach in setting up or constructing an indoor range, all legal requirements must be met. Obtain professional assistance during the planning and design phase

4.02 Planning

- 4.02.1 Planning for the indoor range is often complicated by changes in design and substantial increases in cost. The plan establishes a course of action for those initially involved and for those who follow. For example, if plans are to construct an indoor range for smallbore rifles, backstop design and range maintenance should conform to the requirements for smallbore rifles, not centerfire revolvers.
- 4.02.2 Initial Planning
 - 4.02 2.1 During initial planning meetings, make hard decisions on the limitations for the use of the range. Preserve appropriate records to eliminate possible misuse. Provide information to current users and make sure that future users will be aware of how the facility is to be used. During the initial planning process, much of the information gathering will parallel that used when planning an outdoor facility, but there are important differences.
 - 4.02.2.2 Research. Research will center on what type of building will be needed. Can the range be built in an existing building or will it require a new one? How large should it be? How many shooters will it be expected to serve? How will it benefit the community? Will it be used for competition? Should space be allowed for classrooms? How much will the facility cost? The answers to these questions will determine whether to proceed. As in other construction projects the following should be obtained:
 - (a) Copies of ordinances, zoning regulations, building codes, soil conservation regulations and any other information pertaining to legal requirements must be obtained. A thorough review of these requirements will help in site selection within established zones and will assist in satisfying legal requirements for building design, foundation requirements and health and safety codes.
 - (b) Identify for evaluation either a site for a new building or several existing buildings which may provide suitable design characteristics. Several buildings should be reviewed for the proper structural support. A copy of the original design specifications, usually on file at the local building permits office, can be of significant help.
 - (c) Gather other technical information relevant to the project. This information includes zoning requirements, on-site information and range design criteria. Local zoning codes or health department regulations normally will provide answers or solutions on how the project is to be handled. Permits to construct or modify a building are needed in most jurisdictions. These include a "use and occupancy permit," which in turn, requires signatures from plumbing, electrical and building inspectors and health department officials. Occasionally a special exemption must be applied for before using the facility.

Since some zoning codes may specifically exclude shooting facilities, the planners during the initial planning phase, must determine what zones are affected.

- 4.02.2.3 Site Evaluation: At this point in the project, try to secure any drawings which may exist on the proposed building. Check with the original owner, architect, engineer, builder or office permit for copies. These drawings often indicate the construction material used in the building, thus giving the designers useful information on structural integrity, foundation design, wiring schematics, plumbing arrangements and other information which can be used to determine if the building is suitable. The following reference points should be used in making the initial evaluation of an existing building:
- (a) Building construction: Where possible, avoid using buildings constructed from wood products. Modifications to shore up the structure to support metal backstops or to reduce fire hazards are often difficult and costly. Masonry buildings should be given primary consideration, especially those constructed on concrete slabs. With masonry, the main requirement for indoor ranges -- complete containment of bullets -- is easier and less expensive. The advancements in concrete technology make the use of precast buildings a more viable alternative both financially and structurally. Also, precast concrete panels allow for a smaller initial investment, yet provide expendability as financial resources become available. Precast concrete companies can provide precast buildings complete (job site delivered) if engineering specifications for steel placement are provided on a set of plans (drawings) for the proposed building. Precast assembly allows for the installation of a more suitable roof design for an indoor range, such as steel beam, bar joist or conventional wood frame. Do not consider gabled or hip roof designs. The flat bar joist design is suggested over other types if space is available in which to install ventilation and heating ducts, along with lighting fixtures. The flat roof design also provides support for air conditioning, heating and ventilation equipment outside of the range, thus saving space and reducing cost.
 - (b) Building dimensions: A minimum length of 80 feet is necessary for a 50 foot range, with the width depending upon how many firing points (positions) are needed. Storage areas, waiting areas, restrooms, office, scoring areas and a classroom will call for additional space, but not necessarily on the same floor. A second floor may be more cost-effective than to increase space in a single story building.
 - (c) Modifications: Existing buildings require certain modifications to enhance range safety and efficient use. Windows and doors located forward of the firing line must be secured. Windows must be sealed to prevent bullet penetration and doors must be modified to allow for emergency exit only. The structure must be evaluated for strength to support the added weight of backstops or bullet traps, ventilation equipment, other assorted pieces of range equipment and for the added weight of materials needed to make the walls impenetrable.
Protective devices are needed for doors to prevent bullet penetration and to seal cracks to aid air flows. Protective shields for lighting fixtures must also be provided. In addition to structural integrity, electrical wiring may need modification to provide for added lighting fixtures, ventilation equipment and range operations. Plumbing fixtures may also require modifications to allow for range cleaning.
 - (d) General conversion: Converting existing buildings to indoor range use generally requires difficult and costly modifications. Special precautions must be taken in designing the ventilation system so that all lead or other contaminants are either trapped or expelled from the range so that no adjoining operation is affected. In high density population areas, the exhaust of airborne contaminants may be severely restricted by law requiring the additional installation of HEPA (high efficiency particulate) filtering systems.

- (e) Access: The range should be accessible in any weather condition and must have adequate parking facilities. This aspect is equally important in constructing a new building. Providing access is often expensive if roads do not exist.
- (f) Utilities: Water, electricity and phone lines normally do not present a problem in existing buildings, but new construction calls for running lines to the facility. Often this service is expensive, especially for long runs. Check with the local power, phone and water resource companies for cost estimates, which most companies provide at little or no cost.
- (g) Security: In remote areas where casual security, such as police cruising, is not adequate, take precautions to prevent unauthorized use. Install an alarm system or substantially heavier materials around doors and windows. Where laws permit, and space is available, having a maintenance person living on the property is a good idea.

4.02.3 Final Site Selection

- 4.02.3.1 In making the final decision -- new as opposed to existing -- apply information gathered in the initial planning phase to both preliminary and final drawings. Local laws or regulations may mandate that an architect or professional engineer make up the drawings.
- 4.02.3.2 With a workable plan on paper, pursue a community relations program. The benefits of a well-conducted public relations program are: (1) Helps erase misunderstandings about guns and shows the sport of shooting as a healthy recreational pursuit. (2) Promotes understanding and cooperation in the community when the benefits of a well-planned shooter education program are put forth. (3) Attracts new members. (4) Establishes a friendly working arrangement with the local news media. A good public relations program is best started by coordinating with other potential users, such as Boy Scouts, 4-H, hunter education instructors, law enforcement agencies, Jaycees, etc., who sponsor youth programs and may wish to share the facility.

4.03 Design

- 4.03.1 Based upon the site selected, type of shooting to be done, how many users, site layout and community relations, the next step is to design the facility by preparing detailed drawings showing specifications and necessary dimensions. Not only does a good design, properly laid out in detailed drawings, provide guidelines for construction, it preserves the history of a facility, why it was built, and how it should be used.
- 4.03.2 Designing a range construction project often involves many hours to do it correctly, so allow for maximum lead time in the planning and design cycle.

4.04 Professional Assistance

- 4.04.1 Professional assistance can often be obtained from engineers, architects, draftsmen, attorneys, carpenters, plumbers, electricians and bricklayers. They may be members of local shooting clubs or associations or may live in neighborhoods where future ranges may be located. Professional services should be enlisted whenever possible.

THE RANGE SOURCE BOOK

SECTION THREE

CHAPTER TWO

INDOOR RANGE DESIGN CRITERIA

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11/99

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ARTICLE 1. GENERAL

1.01 Purpose

- 1.01.1 This chapter provides information in the design of an indoor range once the determination has been made of what type facility is needed.

1.02 Chapter Organization

- 1.02.1 This chapter is organized into four sections; (1)General information; (2)Health and safety; (3) Design specifications; and (4) Appendix.

1.03 Cross Reference

- 1.03.1 All chapters in Section I.

ARTICLE 2. HEALTH AND SAFETY

2.01 General Health and Safety

2 01.1 See Section I, Chapter 1, Article 4.

ARTICLE 3. DESIGN SPECIFICATIONS

3.01 Backstops and Bullet Traps

- 3.01.1 Design specifications are based on information gathered from experience, along with testing and research on available materials from which backstops and bullet traps are built. The range builder who plans to construct these fixtures on-site is cautioned that the backstop or bullet trap must be designed according to acceptable standards to reduce back splatter and ricochets.
- 3.01.2 Materials used to construct backstops vary from 10 gauge sheet steel to 1 inch thick armor plate and produce varied results. This variation is largely due to a lack of understanding about the characteristics of steel and what specific type steel should be used. Often what is used is obtained at no cost. The problem with no-cost material is that it very often does not meet design specifications. For example, 10-gauge steel will work well for air gun ranges, but not with .22 caliber firearms. Equally risky is the concept that "using massive 1 inch thick plates will work for all present and future needs". Thickness alone does not guarantee durability or compatibility with a projected use. Thickness, surface hardness, abrasion resistance and specific alloy compositions, combined with how the plates are installed, make equal contributions to a satisfactory backstop.
- 3.01.3 The design of a backstop or bullet trap is also a contributing factor to the service life of the unit. Under-design (use of improper angles, low grade steel, and so forth) virtually guarantees damage will occur, but over design doesn't guarantee it won't. Install steel according to the type of ammunition to be used and according to proven angle configurations (see chart in paragraph 3.01.4). Additionally, backstops and bullet traps manufactured commercially provide a viable alternative to the 45 degree angle backstop.
- 3.01.4 Always base design considerations on what use is planned for a facility. For example, a backstop designed for smallbore rifles may not be adequate for centerfire pistols. The hammering effect caused by repeated bullet strikes on the plates of a backstop will eventually result in some damage. Metal plates selected for use in a backstop or trap must resist repeated stress, according to the degree of stress applied. Necessary characteristics are: resistance to abrasion, resistance to penetration, surface hardness, thickness and alloyed strength to resist metal fatigue. These characteristics in a steel are produced by mixing different metals to form a stronger alloy. This mixture can produce either a soft (ductile) or an extremely hard composition. With a quality alloy, the final factor is installation. For example, erect the metal plates so that stress from a bullet strike is distributed over a larger area to minimize damage. Those involved in the design process should recognize that selecting steel plate is critical. Quality steel is not difficult to find, but it is often expensive and may require special welding techniques. Remember, the time and attention needed to design a quality facility are usually about the same as for an improperly designed one. Plan for quality.

Note: Designers must consider the type of ammunition to be used on a range. The following table is a guide for determining use based on either the use of low energy or high energy ammunition.

Note: In order to build and operate a safe backstop for a shooting range, the plan, specifications and construction of said backstop requires the thorough professional evaluation, guidance and services of professional engineers and architects. The chart below is not, under any circumstances, to be used as a substitute for the necessary professional services of engineers and architects that are required to design and build a safe shooting range backstop.

Range Specifications Yards	Caliber	Bullet Type	Muzzle Velocity	Muzzle Energy	Minimum Thickness	Backstop Angle	MS
25	22 LR	Lead	1125	112	.250	45	AR-450
25	22 WMR	FMJ	2000	355	.250	45	AR-450
25	357 Mag.	JSP	1410	695	.375	45	AR-500
25	357 Mag.	JHP	1550	845	.375	45	AR-500
25	44 Mag.	JSP	1300	900	.375	45	AR-500
25	45 ACP	SWC	775	245	.375	45	AR-500
25	45 ACP	STHP	850	370	.375	45	AR-500
25	45 ACP	FMJ	710	235	.375	45	AR-500
25	45 ACP	FMJ	810	335	.375	45	AR-500
25	50 AE	FMJ	1305	1414	.375	45	AR-500

(Armor Piercing and Incendiary Ammunition Prohibited)

Thickness = Thickness of plate in inches

Angle = Angle of plate in degrees from horizontal

MS = Manufacturers' specification

LR = Long rifle WMR = Winchester Magnum Rimfire ACP = Automatic Colt Pistol

AE = Action Express

FMJ = Full Metal Jacket JSP = Jacketed Soft Point JHP = Jacketed Hollow Point

SWC = Semi Waddcutter STHP = Silver Tip Hollow Point

MV = Muzzle Velocity in Feet Per Second ME = Muzzle Energy in Foot pounds

* NRA highly recommends you contact a commercial manufacturer for your backstop needs.

3.01.5 There are many different backstop and bullet trap designs on the market today. You may want to contact the manufacturers and discuss your specific use, budget, and space requirements, and go with the design that most adequately meets your shooting range needs. (See References to Products & Services section of the Appendix.)

- 3.01.6.2 The General Services Administration (GSA) has written specifications for target backstop steel in their bulletin PBS 3-1395 (INT). The chart shown above generally agrees with the GSA specifications and is available in warehouse stocks. The bulletin also carries the specifications for building a 45-degree angled backstop:

"Steel plates supported by concrete or masonry should be anchored by expansion bolts or toggle bolts, as suitable for construction, with flush countersunk heads, not more than 12 inches on center of all edges of each plate. Joints and edge lines shall be backed with continuous ½ inch plate no less than 4 inches wide. Bolts pierce both facing and back plates. Expansion bolts penetrate concrete not less than 2 inches. Steel plates must have milled edges at all joints.

"Joints must be butted flush and smooth. Plates must be free from buckle or wave after erection. Exposed edges must be beveled at 42 degrees to a fillet approximately 1/16 inch thick. There shall be no horizontal joints in any steel plate work. Welding must meet the American Welding Society Code for welding in building construction:

"Steel plates joined at and supported on structural steel supports must be spot welded to steel supports not more than 6 inches on center."

3.02 Baffles/Deflectors/Shields

- 3.02.1 Baffles on indoor ranges protect lighting fixtures, ventilation and heating ducts, ceilings and target carrier apparatus. Baffles are designed to protect against the occasional errant bullet but not for repeated bullet strikes. Baffles, therefore, must extend the entire width of the range and downward to cover or protect vulnerable ceiling areas or range fixtures. Spacing of baffles on a 50-foot-to-75-foot range depends upon ceiling design. Range distance (firing line to target line) and height are factors. Ceilings, which may also serve as floors for inhabited space above the range, must be impenetrable. Design specifications for new construction pose no problem. However, to modify an existing building, especially one of wood construction, to prevent the escape or penetration of bullets, baffles or deflector plates should be used. Baffle design requires the steel portion of the baffle be covered with a minimum of 1 inch of soft wood. The wood traps the projectile, whereas bare steel redirects it downward into the range area. Ranges with untreated baffles usually show significant damage to concrete floors and often complete penetration through wood floors; therefore, apply a wooded surface on overhead baffles. Baffles are installed at a 25-30 degree angle as measured from the horizontal plane of the ceiling. (See drawing IR-4.)
- 3.02.2 Deflectors, unlike baffles, are installed vertically and horizontally and perform the task of redirecting wide angle shots into the backstop area. Deflector shields (drawing IR-1) protect pilasters, leading edges of sand traps, bottom edges of backstops, doorways, windows, ventilation registers along the wall, etc. Deflectors are generally not covered with wood, but may be. These devices are also installed at a 25-degree angle either to the wall surface or floor.
- 3.02.3 Special impenetrable shields are installed above the firing line, especially in wood frame buildings, to protect ceiling areas. This shield extends the entire width of the range and 12 feet forward of the firing line. Floor shields may be required on wood floors. Construct these shields from metal sheets according to planned use. For example, 10 gauge steel covered with a minimum of 1 inch of soft wood is effective in stopping most pistol calibers. For .22 rimfire use only, 16 gauge sheet steel can be used.

3.03 Walls, Ceilings and Floors

- 3.03.1 Walls, ceilings and floors of an indoor range facility must be impenetrable. This is why a structural analysis must be made of an existing building to determine loading factors which may exceed original design specifications. Wooden buildings may require modifications to support the increased weight. Specifications for new construction call for either poured-in-place concrete, precast concrete or dense masonry block. The common solid cinder block should be used in place of the hollow-core block, because the solid block can withstand glancing strikes and an occasional direct hit without sustaining much damage. Specifications for modifying existing buildings call for adding additional materials to prevent bullet escape. This can be done with wood and steel laminated shields. Extended shooting booths (for pistol ranges only) which will not permit angular shots to strike the wall area between the firing line and the backstop may also be used.
- 3.03.2 Laminated shields can be constructed on site by placing sheet steel or steel plates between two sheets of $\frac{3}{4}$ inch plywood. While this method is more expensive than the extended booth design, it allows for an open firing line and better visibility for the range officer. Walls should be treated beginning 3 feet to the rear of and extending forward of the firing line until all vulnerable surfaces are protected. To aid in sound control, apply acoustical material.

3.04 Shooting Booths

- 3.04.1 Shooting booths, commercially available or built locally, may be desirable on pistol ranges. The panels which comprise the shooting booth can provide an impenetrable barrier between shooters, reduce sound levels, restrict the travel of expended brass and act as a spray shield when revolvers are used. There is some debate as to whether air flow is aided by shooting booths; however, methods discussed under paragraph 3.08, Ventilation and Filtering systems are effective.
- 3.04.2 Any shooting booth installed in a bullseye pistol range should never extend behind the firing line more than 18 inches. Any long extension behind the firing line obstructs the visibility of range control officers.
- 3.04.3 Design criteria for the construction of booth panels:
- (a) Booth panels must be impenetrable by the bullet from any firearm used on the range.
Note: To meet this criterion the panel must be capable of withstanding the impact of a bullet fired at any angle to the surface and at point blank range. In a series of tests using 10 gauge steel plate and firing all-lead bullets at right angles, the plate, covered with a nominal 2 inches of soft wood, withstood direct hits from all standard pistol calibers, up to and including .44 caliber magnum.
 - (b) Must reduce muzzle blast effects on shooters and range personnel, including the shooter occupying a booth. This is accomplished using special acoustical materials.
 - (c) Must not restrict airflow.
 - (d) Must not restrict visibility of the firing line by the range officer.
 - (e) Must extend from floor to at least 6 feet high, preferably to the ceiling.
- 3.04.3.1 Before installing shooting booths, remember some insurance companies require that on commercially operated ranges, shooting booths or separating barriers must be impenetrable. Some of the commercially available booths vary in dimension and may protrude more than the suggested maximum 18-inch rear extension. To compensate, simply move the shooters back a few inches.

3.05 Target Carriers and Turning Mechanisms

- 3.05.1 An indoor range can be operated much more efficiently and safely by installing a target transport system. This system may be a simple handmade device or a completely automatic electrically powered system. Either serves to enhance safety by eliminating the need to walk down range to replace targets.
- 3.05.2 Target carriers should be equipped to handle the various target heights as dictated by the shooter's position. A commonly used design incorporates detachable extension rods of varying lengths, so that the target center is located at the proper height. It is important that for angled plate backstops target heights be adjustable. For example, if one target height is used, the angles required to hit the target would change accordingly and may defeat its design criterion. Optimum height for the four positions are:

Position	Height of Target Center

Prone	12 inches
Sitting	12 inches
Kneeling	28 inches
Standing	59 inches

- 3.05.3 Target carrier systems speed up range operations. During tournaments, it is possible that more relays may complete a course of fire. A turning target mechanism is available that faces the target parallel to the line of sight and then turns the target 90 degrees to the line of sight to begin the stated time period. While not required (NRA Pistol Rule 6.8b), such mechanisms are recommended for pistol competitions. Note: These are not necessary or desirable for rifle.

3.06 Control Booth

- 3.06.1 Range control booths must allow for maximum visibility, easy entry and exit either into the range or into a ready area. The control booth should provide both seclusion from and immediate access to the range environment. This design protects the range officer from frequent exposure to high sound levels and lead emissions. A typical control booth is shown on drawing IR-1.

3.07 Communications

- 3.07.1 Sound levels on indoor ranges require a communications system capable of relaying range commands that are distinct and separate from the sounds generated by shooting activities. **Caution:** Some systems do not account for: (1) shooters who wear two pair of hearing protectors; and (2) persons who have substantial hearing loss. This can be remedied by using visual aids such as flashing lights, or 110dB buzzers.

3.08 Lighting

- 3.08.1 While technological advances in lighting continue, not a great deal of information is available on how to light an indoor shooting range properly. The old method was to install fluorescent cool white or incandescent lamps. The problem with this concept is that these lamps subjected range users to undue eyestrain caused by ultraviolet emissions. "Green" fluorescent tubes have no ultraviolet emissions available, but the quality of light may not be suitable for all indoor applications.

- 3.08.2 A visually safe installation must be free of excessive glare and of any major differences in light levels. This means that the walls, floor and ceiling must be designed to provide some light reflection. It also means that emergency lighting (battery powered) should be used for emergency exits in the event of a power outage.
- 3.08.3 Range lighting involves three systems: (1) General lighting; (2) Local lighting; and (3) Semi-direct lighting. General lighting provides uniform light levels over the entire range area and adjoining areas and is usually installed in a symmetrical arrangement to blend with the architecture. Local lighting supplements general lighting along the firing line to provide better visibility for those tasks associated with the loading and firing of firearms. Semi-direct lighting distribution directs 60 percent to 90 percent of the lighting on the target with a small upward component to reflect from the ceiling and walls to soften shadows and generally improve range brightness. When ceilings are white, lighting fixtures mounted too close create too much glare.
- 3.08.4 Lamp specifications for general lighting should provide 30 footcandles to 50 footcandles of illuminance measured at a point 4 feet above the floor. Local lighting should produce 40 footcandles to 60 footcandles of illuminance on the firing line and the Semi-direct lighting on the targets should achieve 100 footcandles of illuminance. Eliminate or reduce glare by incorporating pastel colors in the interior design. **Caution:** Use materials with colors manufactured into them. Do not paint interior surfaces. Lighting designs should also seek to balance the color of light emissions. Most fluorescent fixtures, for example, produce high levels of blue which alone are not suitable for indoor ranges. If fluorescent fixtures are used, obtain the green tubes or install other light sources to balance the colors.

3.09 Plumbing

- 3.09.1 Plumbing requirements call for a fresh water supply for personal hygiene and for range cleaning chores, along with a waste system that will suffice for normal waste material and for materials removed from the range. The best approach, depending upon the level of filtration used at local sewage treatment plants, is to provide for a dry-well or septic system into which wastes from range cleaning can be deposited. Floor drains would be connected to this alternate waste system while restrooms, showers and sinks would be connected to a regular sewer system.

3.10 Sound Control

- 3.10.1 Sound control on indoor ranges includes two distinct components, sound levels within the range, and sound levels in adjoining, occupied rooms. To minimize amplification of sound within the range by reflection, apply acoustical material to walls and ceiling. To reduce transmission of sound to adjoining rooms, seal air leaks with air-tight insulation around doors, windows, ceiling, and walls, and line ventilation and heating ducts with acoustical material.

3.11 Ventilation and Filtering Systems

- 3.11.1 When designing a ventilation system for an indoor firing range, the worker and his/her exposure to airborne particulate lead is of primary importance.
- 3.11.2 The design engineer is responsible for designing a ventilation system that can comply with the OSHA Lead Standard for General Industry 29 CFR 1910.1025, and other state and local building codes, laws and regulations. If the engineer cannot design a system based on that criteria, or does not adequately understand the laws, codes or regulations, then you may want to select another

engineer. The ventilation system design engineer must choose a design that best addresses the protection of workers, the location and type of climate conditions, the initial start-up cost versus operational cost, i.e., maintenance, repair, and replacements costs of equipment and filters.

- 3.11.3 Total Air Exhaust System is defined as utilizing a 100 percent fresh air make-up. All air from the shooting range area is completely exhausted. This system operates most efficiently and effectively in areas where temperatures are between 50 and 80 degrees throughout most of the year. In such moderate climates, heating and cooling is typically not needed. Heating, cooling and removal of moisture in the air can be achieved by gas or electric units if necessary.
- 3.11.4 Air Cleaning Recirculating System is a system that recirculates between 60 - 80 percent of the air in the shooting range area. The air is filtered during the exchange. The air filtration system permits recirculation of the majority of the shooting range air. The recirculation system reduces heating and air conditioning operating expenses. The recirculating air equipment and exhaust air equipment must be designed to operate in unison to achieve the necessary air quality, optimum filter life, and overall negative pressure within the shooting range. The exhaust and make-up air design must be balanced to ensure the range is always under negative pressure to prevent air from the shooting range entering other parts of the building.

ARTICLE 4. APPENDIX

4.01 OSHA Lead Standard for General Industry

* Portions reprinted with permission from The Lead Industries Association, Inc., *Controlling Lead Exposures in the Workplace*, 295 Madison Avenue, 8th Floor, New York, NY 10017, Phone: 212-578-4750, Fax: 212-684-7714.

- 4.01.1 The National Rifle Association can accept no responsibility for factual misstatements or specific applications of information contained here-in, and reserves the right to amend or modify such information. As OSHA standards and guidelines may be amended from time to time, current standards and guidelines should always be consulted and complied with
- 4.01.2 OSHA only regulates the workplace where there is at least one employee. Ranges that may not fall under the legal jurisdiction of OSHA should consider the regulations as guidelines to ensure the range is operated as safely as possible. "Best management practices" are also discussed that are not currently required by law, but should be reviewed as a proactive approach to range management. OSHA has direct jurisdiction in 29 states to enforce regulation relating to shooting ranges. As of 1995, these states are: AL, AR, CO, CT, DE, FL, GA, ID, IL, KS, LA, ME, MA, MS, MO, MT, NE, NH, NJ, NY, ND, OH, OK, PA, RI, SD, TX, WV, and WI. The other 21 states plus Puerto Rico and the Virgin Islands are known as state plan states; they have their own occupational safety and health plan, which must be at least as stringent as the federal program. The rules to follow in order to be in compliance with federal regulations are printed in the Code of Regulations (CFR). Title 29 covers the labor regulations and part 1910 addresses general industry. Specific subparts deal with everything from asbestos to welding; 29 CFR 1910.1025 deals specifically with lead. 29 CFR 1910.134 covers respiratory protection and 29 CFR 1926.62 cover lead during construction. Copies of the CFRs can be found in most libraries and are also available from local OSHA offices and government printing office bookstores. A copy should be on file with the operating policies of each range
- 4.01.2.1 As mentioned earlier, many other regulations pertaining to shooting ranges must be followed. So it is important to understand all aspects of the range and know who to ask for help when the need arises.
- 4.01.3 Four primary routes of exposure to be concerned about when dealing with lead include:
- (a) Inhalation (nose and mouth)
 - (b) Injection (subdermal)
 - (c) Absorption (skin)
 - (d) Ingestion (mouth)
- 4.01.3.1 Inhalation is the main route of exposure to be concerned with, and it is the area where controlling exposure to lead on shooting ranges can have the greatest impact. Clean air in the worker's breathing zone is critical in preventing overexposure to lead particulate.
- 4.01.3.2 Under normal circumstances, injection is not a concern and rarely found to be a primary cause of lead exposure. Except for organic lead, such as tetraethyl lead in gasoline, skin absorption does not directly contribute significantly to lead exposure. Skin on hands does have a significant role as a transporter of lead from contaminated surfaces to the mouth or transferring lead from contaminated surfaces to food that is then ingested

- 4.01.4 Lead contamination may be a problem both on indoor ranges and outdoor ranges, but most potentially significant human exposure problems are found on the indoor range
- 4.01.4.1 Lead of concern on shooting ranges is metallic lead, all inorganic lead compounds, and organic lead soaps. Lead particulate is released from the primer detonation, the powder combustion (lead compounds are key components in almost all smokeless powders) and the lead portion of the bullet. These particles are harmful if inhaled or ingested. Particulate lead comes from five major sources on a shooting range:
- (1) The primer
 - (2) Shavings produced at the forcing cone in revolvers
 - (3) Shavings from the bullet as it passes through the barrel
 - (4) Impact on backstops
 - (5) Handling of ammunition and spent brass.
- 4.01.5 The regulations require you, as the employer, to ensure that no employee is exposed to airborne lead at a concentration of $50 \mu\text{g}/\text{m}^3$ (micrograms per cubic meter of air) averaged over an eight-hour workday. This is the permissible exposure limit (PEL) as a time-weighted average (TWA) for that day. If any employee is exposed to lead for other than eight hours in any day, the PEL TWA for that day is adjusted according to the following formula:
- Maximum permissible limit (MPL in $\mu\text{g}/\text{m}^3$) = 400 divided by the hours worked that day**
- For example:
- (1) If an employee works ten-hour days, divide 400 by 10 to get an MPL of $40 \mu\text{g}/\text{m}^3$ of air averaged over the ten-hour day. This means the employee cannot be exposed to more than $40 \mu\text{g}/\text{m}^3$ of lead averaged over the ten-hour day.
 - (2) If an employee works two hours a day, divide 400 by 2 to get an MPL of $200 \mu\text{g}/\text{m}^3$ averaged over the two-hour day. This means the employee cannot be exposed to more than $200 \mu\text{g}/\text{m}^3$ of lead averaged over the two-hour day.
- 4.01.6 Air Monitoring. Before you can determine if you are being exposed to air lead in excess of the PEL, you need to know what the exposure is at each workplace. In order to learn this, OSHA has required your employer to measure the exposure of a representative number of employees who probably have the highest risk. The measurement must be done for a *full shift*, using *personal air samplers* and without regard to respirators.
- 4.01.6.1 The first measurement is called the *Initial Determination*, and it is very important. The initial determination will decide what safety measures must be taken by you and your employer.
- 4.01.6.2 If the Initial Determination reveals air lead to be at or above $30 \mu\text{g}/\text{m}^3$, called the *Action Level*, certain OSHA regulations will go into effect:
- (1) Your employer must establish an *Air Monitoring Program* to determine your exposure at each job classification.

- (2) The monitoring must be *repeated every six months*.
 - (3) Your employer must provide *medical surveillance* (physical examination and blood lead tests) to any employee exposed above the action level for 30 or more days per year.
 - (4) Your employer must provide a *training program*.
- 4.01.6.3 During the Initial Determination or follow-up Air Monitoring Program, you may be required to wear a personal air sampler for a full shift. This is the only effective way to measure the air lead at your workplace and is in your own best interest
- 4.01.6.4 If the Initial Determination reveals air lead exposures lower than 30 $\mu\text{g}/\text{m}^3$, then, following a written report, *no further monitoring* is necessary unless a production, process, or personnel change occurs. If the Initial Determination reveals air lead exposures at or greater than the PEL (50 $\mu\text{g}/\text{m}^3$), OSHA requires.
- (1) That your employer conduct the Air Monitoring Program every three months instead of every six months
 - (2) That your employer notify you of corrective action to reduce the air lead exposure.
 - (3) That your employer put into effect other elements of the Standard covering hygiene, housekeeping, respirator usage, and protective work clothing.
- 4.01.6.5 Your rights concerning air monitoring. Under the OSHA Final Standard for Lead you are entitled to:
- (1) An explanation of the monitoring procedures.
 - (2) Observe the monitoring.
 - (3) The opportunity to record results or to receive a copy of the results.
 - (4) A written statement of your exposure level within five days of receipt of the results.
 - (5) A statement of corrective action if your exposure exceeds the PEL.
- 4.01.6.5.1 Your responsibilities concerning air monitoring. In order to best protect your own health, you ought to:
- (1) Participate constructively in the air monitoring program by wearing a personal air sampler and following all instructions provided.
 - (2) Be aware of your airborne exposure level.
 - (3) Follow common sense procedures to reduce your exposure.
 - (4) Make constructive suggestions for reducing air lead levels.

4.01.7 Engineering Controls / Work Practice Controls. Engineering controls and work practice controls can be very effective in reducing the level of air lead. Some common engineering principles that can be used to lower air lead are:

- (1) Better filters
- (2) Improved ventilation
- (3) Shorter hours
- (4) Change of duties
- (5) Personal protective equipment

4.01.7.1 Protecting yourself through common sense work habits and good personal hygiene is your responsibility. You owe it to yourself and to your family to take care of your health. It is easy to do. Here are a few Do's and Dont's which will help you.

- (1) Always wash your hands, arms, and face before smoking or eating. If you fail to do this, you will be putting lead dust directly into your mouth. You wouldn't eat lead paint; why eat lead dust? *Poor clean-up habits are one of the major causes of lead poisoning.*
- (2) Always use care when carrying, mixing, or feeding lead-bearing materials into vessels. Spilling is a major danger because it increases the amount of lead dust entering the air, creates a clean-up problem, and exposes your person and clothing to direct lead absorption.
- (3) Always keep your work area clean using high efficiency vacuum scrubbers. Other methods of cleaning - such as shoveling or sweeping - may only be used when vacuuming is not possible.
- (4) Always leave all work clothes at work and *shower completely* before going home. You don't want to be responsible for family members becoming ill from lead dust which you brought home.
- (5) Always use the ventilation systems properly and follow closely all *Standard Operating Procedures*.
- (6) Never eat, drink or smoke while on a shooting range. Bringing food into an area filled with lead dust will result in your direct ingestion of lead which will settle on your food, cup, or cigarette. This is always dangerous. Always eat, drink, or smoke in a separate area.
- (7) Never create dust by rough handling contaminated objects. Horse play, fooling around, tossing or careless handling of lead is both foolish and dangerous to your health and the health of others.
- (8) Never dry sweep - it creates dust; then the dust either enters your lungs, settles on your clothing, or lands back on the floor where it began. Dry sweeping is not only ineffective, it is dangerous (Wear your respirator when cleaning up!)

(9) Never put your hands in your mouth, bite your fingernails, or wipe your face on your sleeve while at work. During the work day, dust accumulates under nails, gloves, and clothing. Make it a habit to rinse off with water, otherwise you might "wipe-on" the lead.

(10) Never forget to make sure that the ventilation system is on and working properly.

- 4.01.8 Use of adequate ventilation systems normally reduces airborne lead concentrations to below the OSHA PEL of $50 \mu\text{g}/\text{m}^3$. Such a policy can be easily enforced by wiring the exhaust fans to the switches that turn on the targets.
- 4.01.8.1 Lead exposure is further mitigated by the use of jacketed bullets while firing on all ranges. Monitoring during live fire has shown that this practice significantly reduces airborne lead levels. The use of smaller caliber ammunition also helps, but since shooters' preferences encompass a variety of ammunition, it is difficult to control the caliber of ammunition allowed on the range without affecting business.
- 4.01.9 If respiratory protection is required to protect employees, review 29 CFR 1910.134 and follow all applicable sections. Respiratory protection may be required during range cleaning, filter changing, maintenance operations, and so on. Provide employees with all training and equipment necessary to properly use respiratory protection and require employees to use respirators when installing or implementing controls to reduce exposure to lead below the PEL.
- 4.01.9.1 You cannot require employees to wear respiratory protective devices longer than 4.4 hours per day. Additionally, you should have a written respiratory protection program meeting the requirements outlined in 29 CFR 1910.134.
- 4.01.10 Institute a medical surveillance program for all employees who are or may be exposed above the action level for more than 30 days per year. This program should include all the items listed in 29 CFR 1910.1025. An important part of the medical surveillance program involves blood lead monitoring, which must be performed on employees who are or may be exposed above the action level of $30 \mu\text{g}/\text{m}^3$ for more than 30 days per year. This monitoring must be provided by the employer and is covered in greater detail in section (j) of the lead standard.
- 4.01.11 Post the following warning signs in each work area where the PEL is exceeded:

**WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING**

- 4.01.11.1 Assure that signs required by this regulation are illuminated and cleaned as necessary so that the legend is readily visible.
- 4.01.12 Record keeping is an important part of any regulation and is very important for shooting ranges. The regulation requires medical monitoring as follows
- (a) Exposure monitoring:
- (b) Date(s), number, duration, location, and results of each sample taken, including a description of the sampling procedure used to determine representative employee exposure where applicable.

- (c) Description of the sampling and analytical methods used and evidence of their accuracy.
 - (d) Type of respiratory protective devices worn.
 - (e) Name, Social Security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent
 - (f) Environmental variables that could affect the measurement of employee exposure.
 - (g) Maintain these records for at least 40 years or for the duration of employment plus 20 years, whichever is longer.
- 4.01.13 Whenever respiratory protection is used to comply with the requirements laid out in the lead standard, follow all requirements associated with training, fit testing, medical qualification, use storage, cleaning, and so forth found in this regulation to ensure proper protection of employees.
- 4.01.14 29 CFR 1926.62. This regulation applies to all construction work where an employee may be occupationally exposed to lead. This covers all work for construction, alteration, or repair, including painting and decorating. This standard is mentioned because there is always the potential for modification to range facilities and you must be aware that there are specific requirements addressing these modifications.

4.02 Effects of Lead*

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- 4.02.1 Lead is poisonous at high doses. Overexposure to it can cause serious illness and even death. There are two types of overexposure - acute and chronic.
- 4.02.1.1 Acute overexposure occurs when you absorb a large dose of lead within a short period of time. In industry it almost never happens. (NRA Note: No known case of acute overexposure of lead has occurred on a shooting range.)
- 4.02.1.2 Signs and symptoms of chronic overexposure to lead. Chronic overexposure occurs with the slow, continual absorption of lead over a long period of time. Chronic overexposure is the more realistic danger in industry. Because the accumulation of lead in your system is slow, and because the effects are not always noticeable or distinguishable from those associated with minor illnesses, chronic overexposure is often overlooked - until signs are unmistakable. By then, permanent and irreversible damage may have already occurred.
- 4.02.1.2.1 Chronic overexposure to lead can impair vital functions of the body and damage vital organs. Among the parts of the body affected by lead are the blood, the gastro-intestinal tract, the nervous system, the kidney, and the reproductive system.
- 4.02.1.3 Blood. Overexposure to lead can produce anemia. This occurs when the lead in your system interferes with your body's ability to produce and sustain red blood cells. As a result there is a general lowering of your hemoglobin, an oxygen-bearing substance in the red blood cells. This lessening of oxygen in the blood can lead to feelings of dizziness or fatigue. According to

OSHA, these symptoms may develop with blood lead levels as low as 50 $\mu\text{g}/100\text{g}$ (50 micrograms of lead per 100g of whole blood).

- 4.02.1.4 Gastrointestinal Tract. Excessive absorption of lead can also affect the gastrointestinal tract. Experts do not completely understand how lead affects the gastrointestinal system, but the symptoms are easily recognized: colic (stomach pain), loss of appetite, nausea, insomnia, fatigue, muscle and/or joint pain and constipation. Another sign is a pale color to your skin.
- 4.02.1.5 Reproductive System. Overexposure to lead may have serious effects on the reproductive systems of both men and women. Pregnant women, in particular, should avoid prolonged exposure to lead because it can cross the placental barrier and affect the unborn child. Although the extent of lead's effect on an unborn child is not known, it is reasonable to assume that the fetus cannot accept the same blood lead levels as adults. Therefore, a pregnant woman has to be even more careful about her exposure to lead than anyone else. Some women who have been overexposed to lead have reported menstrual irregularities, as well as increased number of premature births, miscarriages, and stillbirths. Men can also suffer from reproductive system disorders. Although experts disagree on the subject, OSHA feels there may be a decrease in sexual desire, impotence, decreased ability to produce healthy sperm, and sterility as a result of chronic overexposure to lead.
- 4.02.1.6 Nervous System. Lead can have a bad effect on both the central nervous system (brain, spinal cord) and the peripheral nervous system (nerves in arms, legs, etc). Central nervous system ailments are extremely rare.
- 4.02.1.7 Damage to the peripheral nervous system is more common than damage to the central nervous system, but it is still rare in modern industry. Some recognizable signs include weakness in the hands and fingers, "wrist drop" or "foot drop," and tremors.
- 4.02.1.8 Kidney. Long-term exposure to lead can result in kidney damage. Although the OSHA standard is designed to protect against kidney damage, you must be very careful because:
 - 1. A damaged kidney cannot be repaired, and
 - 2. Normal biological monitoring (blood lead tests and physicals) cannot detect early kidney damage.
- 4.02.1.8.1 Your best protection against kidney damage is to limit your intake of lead by following your own common sense and the work rules set down for your protection.
- 4.02.2 What can you do about overexposure to lead? First, you should notify your employer and your physician if you develop any of the signs or symptoms associated with lead poisoning or if you desire medical advice about your ability to have healthy children.
- 4.02.2.1 Secondly, you should know the dangers, signs and symptoms of lead overexposure and take common sense steps to reduce your risk.

4.03 Health Monitoring Procedures*

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- 4.03 1 Only through individual medical surveillance is it possible to determine how you, as an individual, are being affected by the exposure to lead. No two people are the same, no two people will react the same way to exposure. The only way you can be sure of your reaction is to participate in your employer's medical surveillance program.
- 4.03.1.1 Your participation in this program is especially important if:
- (1) You work in high lead exposure areas.
 - (2) You have a high burden of blood lead from past exposures.
 - (3) You are exposed to additional lead outside of work.
 - (4) You have a medical condition which could be made worse by exposure to lead.
 - (5) Your lead absorption rate changes.
- 4.03 2 OSHA Requirements. OSHA has established several rules which must be followed in regard to your company's medical surveillance program. First, you must be provided with medical surveillance (physical examination and blood lead testing) if you are exposed to air lead above the "action level" ($30 \mu\text{g}/\text{m}^3$) for 30 days or more a year. Second, the employer must provide the medical service free of charge and at a convenient time and place. All medical services must be performed by, or under the supervision of, a licensed physician.
- 4.03.2.1 If you are exposed to lead above the action level for 30 days or more, you must have a PbB (blood lead) and ZPP (zinc protoporphyrin) test every six months. The PbB test determines the number of micrograms (μg) of lead in every 100 grams of blood. If your blood lead exceeds 40 micrograms per 100 grams (written $40 \mu\text{g}/100\text{g}$) your testing must be increased to every two months. Furthermore, your employer must inform you in writing if your blood lead is in excess of $40 \mu\text{g}/100\text{g}$. He must also inform you in writing of the provisions of the Medical Removal Plan.
- 4.03.2.2 Medical Examinations. If your PbB test shows that your blood lead level is at or above $40 \mu\text{g}/100\text{g}$ blood, you must then give the doctor the necessary information about your work and medical history, and the physical exam must include tests to check your blood chemistry and kidney function. You may also ask for a laboratory evaluation of male fertility or a pregnancy test, whichever applies. The physician must provide the company with a written opinion, and you must receive a copy. You also have the right to request a second opinion on any medical findings or recommendations by the doctor.
- 4.03.2.3 Medical Removal Protection. Medical Removal Protection (MRP) permits your employer to temporarily remove you from a high-exposure operation if your blood lead becomes too high. Under the OSHA-established MRP, you are entitled to:
- (1) Protection of your earnings, seniority or other benefits which you would have had;
 - (2) Your job back when you are able to return to it.

- 4.03 2 4 If your average blood lead level reached 50 $\mu\text{g}/100\text{g}$ or two consecutive blood lead samples were above 60 $\mu\text{g}/100\text{g}$, you will have to be removed from any job where the air lead exposure is 30 $\mu\text{g}/\text{m}^3$ or greater, and you cannot return until your blood lead drops to 40 $\mu\text{g}/100\text{g}$ or less. You may also be removed upon the written recommendation of the company doctor. In such cases you will only be allowed to return to your job when the doctor says that it is safe for you to do so
- 4.03.2.5 Record Keeping. Your employer is required to keep your medical records on file for 40 years or for at least 20 years after your termination of employment, whichever is longer. These records must show your name, results of any blood lead tests or physical examinations, and any opinions written by a physician.
- 4.03 2.6 If you have been temporarily removed from a job under the MRP, this must also be kept on file and must include, in addition to your name and social security number, the dates of removal and return and the reason for removal. You or your authorized representative have a right to see these records.
- 4.03.2.7 If you were removed from your job as a result of elevated blood levels, you must be given a monthly blood test. If you were removed as the result of a doctor's recommendation, you must be given the tests or examinations which the doctor prescribes. Note: Failure to comply with the follow-up medical service may cause you to lose your benefits under MRP.
- 4.03.2.7.1 Medical removal is a last resort and is not desired by anyone. You may have to be removed to a job or shift that you do not like. Your employer will have to train a new person to take your place. To avoid medical removal:
- (1) Participate in your company's medical surveillance plan.
 - (2) Use common-sense work habits and personal hygiene to avoid overexposure.

ATTACHMENT 9

Noise control solutions for indoor firing ranges¹⁾

Chucui A. Kardous^{a)} and William J. Murphy^{b)}

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Peak sound pressure level measurements conducted at indoor firing ranges ranged from 157–168 decibels (dB). Exposure to high-intensity impulsive noise during target shooting at indoor firing ranges has been identified as a significant contributor to noise-induced hearing loss among shooters. In addition, firing ranges that are constructed with adjacent areas or housed within a larger building structure require minimal sound transmission to occur outside the firing range. Several principles of noise control engineering can be applied to improve the absorption of impulse noise inside the firing ranges and limit the transmission of such impulses to adjacent areas and spaces. Although little can be done to control the direct exposure of shooters to the firing of their own firearms, several noise control solutions are presented to reduce the secondary exposure off reflected surfaces and from other shooters. This paper will provide a general overview of noise control solutions aimed to improve sound absorption inside the firing range and reduce the transmission of airborne and structural-borne sounds to adjacent areas and facilities. © 2010 Institute of Noise Control Engineering.

Primary subject classification 21.3.6. Secondary subject classification 30

1 INTRODUCTION

Indoor firing ranges are frequently used by law enforcement and recreational shooters because they offer protection from inclement weather conditions and can be operated around the clock under controlled environmental conditions. The National Institute for Occupational Safety and Health (NIOSH) estimates that 16,000 to 18,000 firing ranges operate in the United States. The Bureau of Justice estimates that there are more than 1 million federal, state, and local law enforcement officers in the United States who regularly train in the accurate and proficient use of firearms¹. The National Association of Shooting Ranges estimates that 40,000–60,000 workers are directly employed as instructors and range masters². The National Shooting Sports Foundation estimates

that 20 million active target shooters use firing ranges for practice or competition³. However, many firing range facilities lack adequate environmental and occupational controls to protect the health of shooters and range personnel from the effects of airborne lead, carbon monoxide (CO), noise, and other potentially harmful exposures. Although lead and CO exposures pose greater long-term health risks, this paper will concentrate on noise control solutions to reduce exposure to impulse noise at indoor firing ranges.

The discharge of weapons produces impulse sound levels that often exceed the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) and the NIOSH recommended exposure limit (REL) of 140 dB peak sound pressure level^{4,5}. The International Organization for Standardization (ISO) 1999:1990, and the American National Standards Institute (ANSI) S3.44-1996 also state that no exposure should be permitted if the peak C-frequency-weighted sound level exceeds 140 dB^{6,7}. Exposure to impulse noise can cause acute acoustic trauma, which can be followed by symptoms such as tinnitus and temporary hearing impairment^{8,9}. Exposure to impulsive sounds that exceed a critical sound pressure level may cause direct mechanical damage to the inner ear and sudden hearing loss^{10,11}.

NIOSH has conducted several health hazard evaluations (HHE) of firing ranges for federal and state law enforcement agencies. The evaluations examined the potential risks posed to law enforcement officers who

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^{a)} National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio, USA, email ckardous@cdc.gov

^{b)} National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio, USA

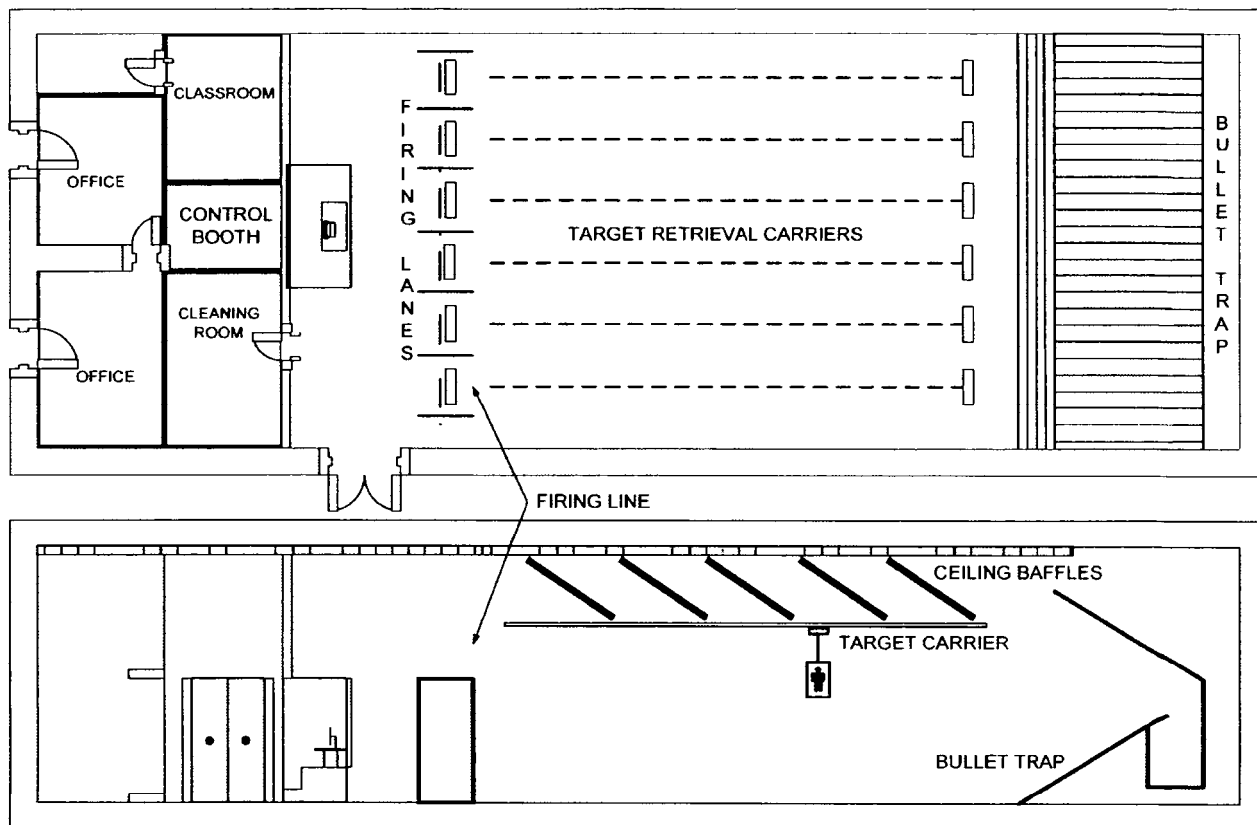


Fig. 1—Floor and sectional diagrams of a standard indoor firing range

are required to undergo annual qualification with handguns, shotguns, and rifles¹²⁻¹⁴ Effective noise control measures are necessary in order to reduce noise-induced hearing loss among firing range operators, employees, and shooters as well as to limit the transmission of such noises to adjacent buildings and other occupants NIOSH provided noise abatement strategies that ranged from simple noise control measures (such as sealing construction joints and leaks) to elaborate design modifications to reduce transmission structural-borne sounds¹⁵ This paper will expand on prior recommendations and provide a general overview of the variety of noise control solutions to improve sound absorption inside the range and reduce the two primary components of sound transmission—airborne and structural-borne sounds. The noise control solutions provided in this paper are compatible with ventilation requirements and meet fire and building codes

2 INDOOR FIRING RANGE COMPONENTS

Most indoor firing ranges are 80 to 120 feet long, 8 to 10 feet high uprange of the firing line, and 20 to 80 feet high downrange of the firing line Some firing ranges are standalone structures while others are

housed inside existing buildings that have available spaces such as basements or sub-basements. The basic components of all firing ranges consist of a firing line, a target, and a bullet trap Design considerations may vary based on planned use, but they must address the basic requirements for operating a firing range—providing ballistic protection, appropriate ventilation, acoustic isolation, and adequate lighting. Figure 1 shows a diagram of a standard indoor firing range

2.1 Structural Components

2.1.1 Walls

Firing range walls are usually constructed of poured concrete, precast concrete, or masonry block The walls must be impenetrable and provide adequate ballistic protection from stray bullets and back splatter.

2.1.2 Floors

Firing range floors are usually constructed from dense reinforced concrete with a smooth surface finish. The surface area must be free of any protruding edges or obstructions. Floors are usually slanted slightly from up range toward down range to allow for better maintenance and cleaning

2.1.3 Roofs and ceilings

Firing range roof construction may vary based on the requirements of adjoining facilities. Typically, roofs are constructed from steel joists or precast concrete panels with a smooth flat surface that will redirect misfired bullets, facilitate maintenance, and prevent lead buildup. Roofs made of steel joists require that a safety ceiling or ceiling baffles be installed to redirect stray bullets and prevent back splatter.

2.1.4 Adjoining areas

Many indoor firing ranges provide additional spaces such as a cleaning room for weapons, a classroom, restrooms (including shower facilities), office areas, lounge area, or storage and maintenance rooms. Design considerations must include measures to maximize sound transmission loss between the firing range and the adjacent spaces.

2.1.5 Passageways and doors

Passageways are used to physically isolate the firing range from the adjoining areas. Passageways can also serve to reduce sound transmission through the use of acoustically treated walls and self-closing doors.

2.2 Physical Components

2.2.1 Shooting booths

Some firing ranges are equipped with shooting booths to provide shooters with a defined firing area and to reduce potential hazard from misfires and ejected bullet cartridges from other shooters. Shooting booths are made of partitions or panels which can be acoustically treated to reduce the effect of weapons discharge on shooters. The booths may be equipped with communication or target-operation equipment; target or booth lighting controls; shelves for holding weapons and bullets, or to prevent shooters from going downrange; and equipment for practicing shooting from behind a barrier. The firing line runs along the downrange edge of the shooting booths, and some ranges have detector equipment which sets off an alarm when a shooter passes this line during shooting. Some shooting booth panels are removable to allow for maintenance and service of communication and control systems.

2.2.2 Control station

The control station houses the central controls for the firing range equipment, communication, lights, and security. The controls are operated by the range master—the designated official responsible for range operation and management. The control station must



Fig. 2—A typical control booth overlooking the operations and controls of a 20-lane indoor firing range.

provide the range master with unobstructed line of sight of the firing lanes and all shooters. Control stations are usually constructed of concrete blocks with bulletproof observation windows. Figure 2 shows a control booth layout for a 20-lane indoor firing range.

2.2.3 Backstops and bullet traps

Backstops and bullet traps are used to absorb the energy from the bullet and capture it. Bullet traps come in a variety of designs and are usually constructed of impenetrable metal plates. The thickness of the plates and the materials used depend on the velocity and energy levels of the projectiles to be fired in the range. Most modern traps consist of angled hardened steel plates that deflect the bullets into other metal plates to remove their energy. The plates must be resistant to penetration, abrasion, and metal fatigue. The traps direct the spent bullets to a collection area in front of the trap or, for high-energy projectiles, at the back of the trap. Figure 3 shows an escalator-type bullet trap with rubberized and hardened steel plates; the bullets are collected through the opening between the plates into a collection tray.

2.2.4 Target systems

Target systems consist of a target, a target carrier system, and a target control system. Targets for indoor firing ranges are usually a paper sheet or piece of corrugated cardboard with a printed target image on the sheet. The target carrier system allows the firing range to operate more efficiently and safely by transporting the target and frame between the firing line and the target line, in both downrange and uprange directions. The target control system allows the range master to control the operation and movement of the targets through a central control station in the control booth. Some firing ranges provide local control modules that can be operated in the shooting booths.

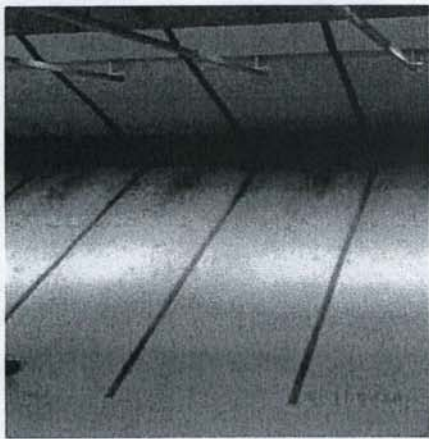


Fig. 3—An escalator-type bullet trap with rubberized and hardened steel plate. The bullets are collected through the opening between the plates into a collection tray.

2.2.5 Baffles/deflectors/shields

Baffles are typically constructed of armored plate steel covered with fire-rated plywood and are installed at a 25–30 degree angle measured from the horizontal plane of the ceiling. Baffles are used to protect ceilings, lighting fixtures, ventilation ducts, and any other unprotected element from stray bullets. Deflectors are similar to baffles, but are not usually covered with plywood; they can be installed either vertically or horizontally and are used to redirect stray bullets from unprotected fixtures and elements inside the firing range such as doors, windows, and ventilation registers. Shields are constructed of plate steel and plywood and form a special safety ceiling located directly above the firing line up to 12 feet downrange. Figure 4 shows ceiling baffles used to protect the lighting fixtures and ventilation ducts inside the 20-lane indoor firing range.

2.2.6 Windows

Windows present a special challenge to controlling noise inside the firing range and limiting sound trans-



Fig. 4—Ceiling baffles used to protect the lighting fixtures and ventilation ducts inside the 20-lane indoor firing range.

mission to adjacent areas because they provide less transmission loss than typical wall structures. However, windows are essential in the control booths and other master control operations. Special attention must be paid to the acoustic rating and bulletproof requirements of windows.

2.3 Operational Components

2.3.1 Ventilation system

The ventilation system is a critical component of the design of an indoor firing range. Proper ventilation reduces shooters' exposure to airborne lead and other combustion byproducts. Ventilation systems consist of supply and exhaust air systems and associated ductwork. Supply air can be provided through a perforated wall plenum or radial air diffusers mounted at ceiling height. Airflow along the firing line should be no more than 0.38 m/s (75 feet per minute, fpm) with a minimum acceptable flow of 0.25 m/s (50 fpm)¹⁶. Air is typically exhausted at or behind the bullet trap. Some firing ranges are designed to have multiple exhaust points downrange to maintain downrange flow and desired velocities at the firing line. The exhaust system should be designed to provide minimum duct air velocities of 12.70–15.24 m/s (2,500–3,000 fpm) (Industrial Ventilation Manual, 25th Edition, Table 3–2)¹⁷. The equipment and designs for the ventilation systems are varied, most firing ranges have one supply and one exhaust fan, however, some have multiple supply or exhaust fans. Very often, the air-flow rate required by the firing range and space constraints for the fans dictate the number and types of fans. Most firing ranges have systems that supply 100% outside air to the firing range and exhaust all of the air to outside the building; but, some firing range ventilation systems are designed to recirculate some of the exhaust air to the supply air system. The exhaust air from most ranges is filtered before being exhausted outside the building or recirculated to the supply system.

2.3.2 Lighting

Lighting in the range consists of control booth, uprange area, shooting booth, and downrange lighting systems. Control booth lighting is usually manually controlled and consists of general lighting and low-level lighting used during particular shooting conditions. Lighting uprange of the booths is general ceiling-level lighting and can usually be controlled manually or from the central controls. Lights downrange of the firing line are usually spotlights used to illuminate the targets at various distances downrange of the booths.

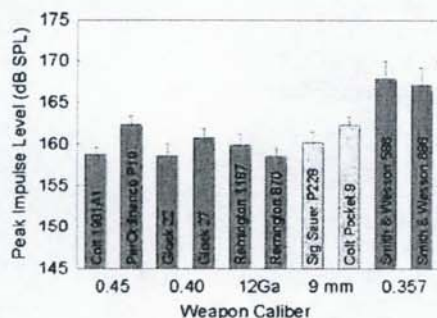


Fig. 5—Measured peak sound pressure levels from a selection of small-caliber firearms. Peak impulse levels range from 157 to 168 dB SPL. The error bars represent one standard deviation for an $N = 170$ (34 conditions times 5 shots/condition).

2.3.3 Safety control systems

Safety control systems are installed to protect the shooters during range malfunction or emergency situations. Such systems may include warning lights, alarm bells, and air-flow and filtration monitors.

3 NOISE CONTROL ENGINEERING SOLUTIONS

NIOSH investigators conducted several assessments of indoor firing ranges to identify the salient acoustic

parameters associated with typical live-firing sessions and provide noise abatement recommendations. Peak sound pressure levels measured inside the firing range during a live firearms training exercise ranged from 157 to 168 dB (unweighted) and equivalent sound levels (Leq) of 122 dB (A-weighted). Figure 5 shows the measured peak sound pressure levels obtained at ear level and six feet to the right of the shooter. Figure 6 illustrates the one-third octave band spectra from a selection of small-caliber firearms measured at the same position those in Fig. 5. The ventilation system alone generated sound levels between 75 to 85 dBA. It is important to note that these investigations also highlighted the limitations of current noise measurement equipment (i.e., noise dosimeters and sound level meters) to make accurate measurements in predominantly impulsive noise environments¹⁸. Special attention must be paid to the use of instrumentation and specialized data acquisition systems that are capable of measuring the type of impulse sounds generated from firing weapons.

An effective hearing conservation program should be implemented for all personnel who use a firing range as a condition of their employment. The program should be designed to meet the minimum requirements set forth in the OSHA noise regulation (29 CFR 1910.95). Included in the requirements of a hearing conservation program are certain key elements such as noise exposure monitoring, audiometric testing, engineering and administrative controls, hearing

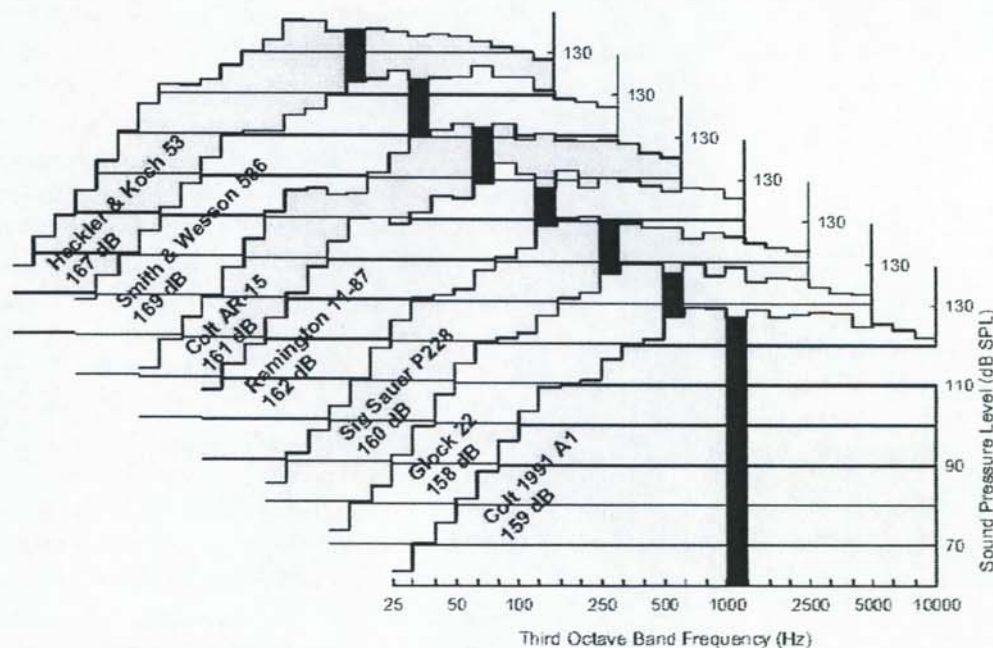


Fig. 6—One-third octave band spectra collected from several types of weapons for 43 millisecond (m)s samples of the initial impulse event. Each spectrum is offset to demonstrate the general character of a small-caliber weapons discharge. Most spectra have a maximum level at about 600 Hz and a change of not more than about -10 dB in the frequency bands above 600 Hz.

Table 1—Noise reduction coefficient of some common building materials and absorptive materials used at indoor firing ranges.

Common Materials	Sound absorption coefficient (α)						
	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	NRC
Concrete block (Painted)	0.10	0.05	0.06	0.07	0.09	0.08	0.05
Concrete floor	0.01	0.01	0.01	0.02	0.02	0.02	0.00
Glass	0.18	0.05	0.04	0.03	0.02	0.02	0.05
Plywood	0.28	0.22	0.17	0.09	0.10	0.11	0.05
Absorptive Materials	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	NRC
2" Acoustic ceiling tile	0.13	0.74	1.26	1.18	1.12	1.03	1.10
2" Acoustic ceiling baffles/banners	0.38	0.64	1.28	1.60	1.50	1.12	1.25
1" Acoustic wall panels	0.11	0.30	0.77	1.02	1.00	1.00	0.85
1" Absorptive noise barrier	0.12	0.47	0.85	0.84	0.64	0.62	0.72
1.5" Acoustic steel ceiling deck	0.13	0.55	0.79	1.01	0.53	0.25	0.70

protection devices, education and motivation, and record keeping.

This paper will only examine noise control techniques that can be used to improve sound absorption within the firing range and to reduce sound transmission to adjacent areas by addressing the transmission of airborne and structural-borne sounds. It is important to understand that such noise control techniques and solutions might help reduce overall noise levels inside a firing range and adjacent facilities, but it has limited effect on the noise exposure of the person firing the weapon. Although the use of silencers and other weapon modifications have been shown to reduce the noise emissions generated from small firearms, the overall noise reductions are not significant enough to eliminate the need to wear hearing protection^{19,20}.

3.1 Sound Absorption

Sound absorption inside the firing range can be improved through the design of acoustically treated walls, floors, and ceilings and the application of absorptive materials to existing structures and elements within the firing range. Table 1 compares the absorption coefficients for some common building materials versus some absorptive materials used inside firing ranges. Note that NRC values higher than 1.0 are provided because the testing of the materials does not take into account diffraction effects at the edges of the material samples.

3.1.1 Interior wall treatments

Indoor firing ranges are typically quite reverberant given that the floor and walls are usually made of concrete and the ceiling may be made of prefabricated slabs or metal sheets. To reduce the reverberant noise

resulting from the blast of ammunition, sound-absorbing products have been installed in firing ranges. These products have been found to be effective in helping a shooter receive less noise from other shooters' weapons by reducing noise reflections from the walls, floors, and ceilings. Reduced reverberant energy will increase speech intelligibility in the range. Reverberation times in poorly treated ranges can easily exceed an RT_{60} of 3 seconds whereas treated walls and surfaces can reduce the RT_{60} to between 1.5 and 0.7 seconds. Given the similarity of the spectra from various weapons shown in Fig. 6, the design of absorptive elements in the wall can help to minimize the reflected impulses independently of what weapons are used.

Sakamoto et al.²¹ investigated the design of perforated panels and rib/slit structures and placement of absorbers within the wall cavity as well as the separation of the panel and absorber from a backing wall. Nominally, the slits were 10 centimeters (cm) wide and spaced 25 cm on center. The absorptive layer was most effective when placed directly behind the slits with an air cavity between it and the backing wall as shown in Fig. 7. The absorptive cavity principally relies on the Helmholtz resonator. The dimensions of the ribs and slits could be optimized to create the first resonant peak in the 500 to 1000 Hz region. A thicker absorptive layer increased the calculated absorption coefficient near the Helmholtz resonance. Varying the depth of the slit enhanced the resonant peak but reduced absorption in the adjacent frequency regions. If the choice is to use a perforated panel, then absorptive backing should be positioned against the panel and an air space provided. Kristiansen and Vigran²² demonstrated that increasing the airflow

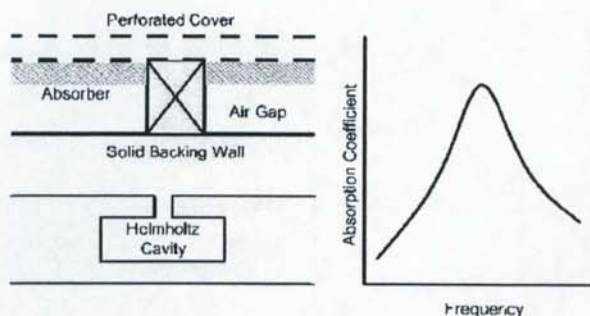


Fig. 7—An example of a resonant cavity, where an absorber is placed directly behind the slot to enhance the performance of the cavity loss.

resistance of the absorptive layer substantially increased the absorption coefficient at the resonant frequency of the Helmholtz slit resonator.

3.1.2 Ceiling treatments

Acoustic materials have been applied to the plywood of the safety ceiling shield directly above the firing line and have been shown to be effective in reducing the noise from weapons discharge. Several manufacturers supply acoustically treated safety ceiling panels and baffles that are fire-rated and have excellent sound absorption at 500 and 1000 Hz (sound absorption coefficient between 0.73 and 1.0). Some manufacturers supply perforated-steel acoustic decks that can be used for the construction of roofs and ceilings. The acoustic decks come in different thicknesses and can achieve an NRC from 0.65 to 0.90 while providing the required vertical and horizontal load resistance. The noise absorption coefficients for the $1\frac{1}{2}$ " deck is provided in Table 1. Figure 8 shows a cross diagram of the acoustic deck design.

3.1.3 Shooting booth treatments

The construction and installation of shooting booths made from hardened fiberglass and the application of absorptive materials have limited the noise from weapons discharge on other shooters. The generated



Fig. 9—State-of-the-art design configuration for shooting booths with clear bullet-resistant, acoustically treated fiberglass panels, and local target and lighting controls.

impulse sound would have to travel around the partition or reflect from the ceiling to reach other shooters. The installation of absorptive ceilings or absorptive panels directly above the shooting booths also serves to limit the reflected noise. Figure 9 shows a state-of-the-art design configuration for shooting booths—clear bullet-resistant, acoustically treated, fiberglass panels with local target and lighting controls.

It is important to note that some acoustical materials and products may be incompatible with the lead found in firing ranges. One characteristic of some sound-absorbing materials is that they are made of soft, porous materials designed to trap noise energy. However, these types of materials can also be effective in trapping and accumulating lead. The types of noise control materials used in firing ranges have to take into account this potential lead contamination. Carpets on the floor of indoor ranges are effective in reducing sound reverberations, but they also become contaminated by lead fairly quickly. Routine vacuuming of the carpets will not eliminate this lead contamination. A rubberized flooring material that has sound deadening properties is more easily cleaned to eliminate the lead hazard. Ceiling panels that show obvious contamination (dark patches) should be replaced when needed. The plate steel used in bullet traps at the end of the

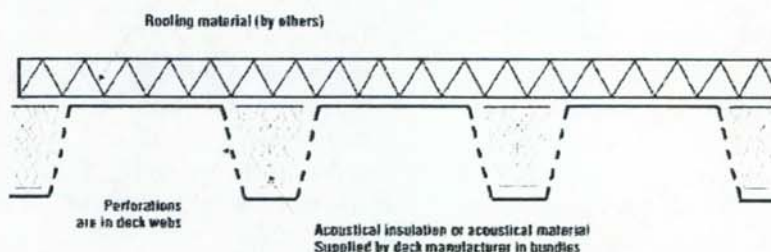


Fig. 8—A cross-sectional diagram of the perforated steel acoustic deck used for constructing roofs and ceilings.

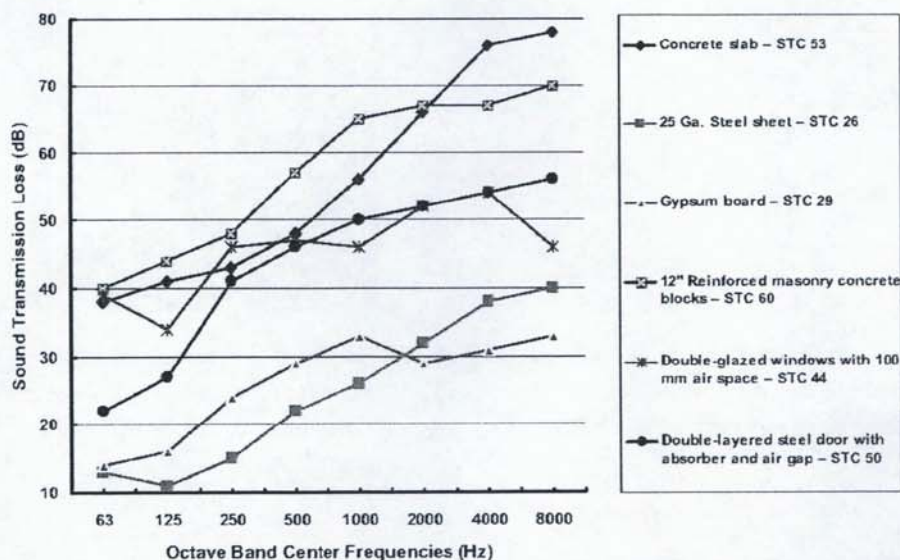


Fig. 10—Sound transmission loss and the STC of some common building materials and acoustically treated elements that can be used to improve sound transmission loss at indoor firing ranges.

range can be replaced with composite metal and plastic products that do not continue to “ring” after being struck by a bullet.

3.2 Sound Transmission

Sound transmission between the firing range and other parts of the building structure occurs when the sound waves generated from the discharge of weapons travel through the air and impact the surface of the walls, ceiling, floor, doors, and windows that separate the firing range from the adjoining spaces. In order to provide significant improvement in noise reduction from the firing range into the adjacent spaces, it is necessary to treat both the direct sound transmission paths and all flanking paths. The sound transmission class (STC) method has been developed to assign a single value to the one-third octave band TL data²³. Figure 10 shows the sound transmission loss and the STC of some common building materials as well as acoustically treated elements that can be used to improve sound transmission loss at indoor firing ranges.

3.2.1 Wall construction

The design and construction of the adjoining walls are critical to making the adjacent rooms usable. In the ranges studied by NIOSH, peak sound pressure levels ranged from 157 to 168 dB depending on the position of the measurement. Sound pressure levels in adjacent areas reached 136 dB in the control booth, 115 dB in the classroom, 110 dB in the cleaning room, and 108 dB in the office. Figure 11 shows octave band sound levels measured in one of the firing ranges and its adjacent areas.

In one of the ranges, the adjoining wall consisted of a concrete block wall that did not extend completely to the roof and was common with both the control room and the classroom. The transmission loss for a simple concrete block wall should have provided nominally 45–50 dB noise reduction between 500 and 1000 Hz.

In order to maximize transmission loss from walls, design considerations should address the construction of wall structures from a combination of mass elements, air gaps and absorptive materials. Several papers examined the transmission of sound through layered wall constructions. Allard et al.²⁴ demonstrated that a single layer of wall with an air gap and a layer of absorptive batting provided superior performance when compared to the same wall without an air gap. Bolton et al.^{25,26} showed that the use of two panels, one layer of absorptive material, and an air gap between the panels provided the greatest transmission loss. Though Bolton et al. examined a specific thickness of aluminum plates and urethane foam, the results should generalize to a broader class of wall construction. The best performance was achieved by having the foam layer bonded to one of the panels and an air space between the panel and the wall. If the common wall was built with wallboard and studs, then it should be double thickness with a gap between the two sets of studs, with added insulation and a mass-loaded septum to provide optimum transmission loss. The range side of the wall should be lined with plates of either steel or aluminum of $\frac{1}{4}$ " to $\frac{1}{2}$ " in thickness. For the purpose of calculating the behavior of the plates, these plates can be treated as thin plates for frequencies of interest, 20–20000 Hz. Constructing the wall with a single thickness of studs and

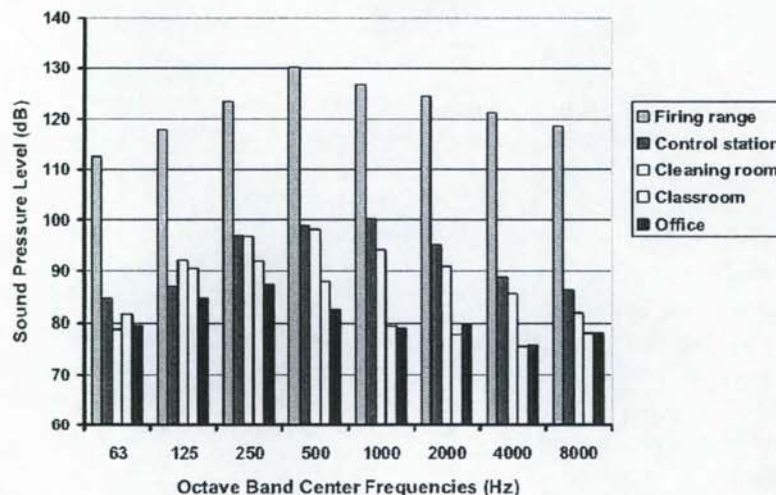


Fig. 11—Octave band sound levels measured in one of the firing ranges and its adjacent areas.

wallboard on both sides of a stud would be markedly less effective in attenuating sound. In this type of design, the airborne impulses from the range side will be directly transmitted through the studs to the wallboard on the other side. Also, the air volume in the wall cavities acts as a spring in a mass-air-mass resonance system. This type of system will have symmetric and asymmetric resonances. Adding the second stud wall decouples the two sides of the wall and increases the transmission loss. Filling one side of the wall with insulation serves two purposes: 1) sealing any leaks due to joints or cuts in the wall surface, and 2) creating a material through which energy will be lost through the friction process. Warnock and Quirt²⁷ measured an approximate STC of 63 for double-layered 13 millimeter (mm) drywall on both sides of a double stud construction with a 25 mm gap between the stud walls and cavity absorption.

The STC for a block wall with 65 mm steel studs on both sides of the block wall and fiberglass filling in the cavities was 72. The maximum transmission loss of 70–75 dB occurred in the 500–1000 Hz range. Because the use of plates may be necessary to stop errant shots, the plates could be attached with adhesive to the studs on the range side and fiberglass or cellulose filling placed in the cavity. To prevent direct transmission from the range stud-wall to the block wall, the studs should not be directly attached to the block wall. Although TL data for such walls only apply to continuous sounds, it is possible that the peak sound pressure level of an impulse sound of 150 dB can be reduced to less than 80 dB using this design.

3.2.2 Passageways and doors

A well-designed passageway serves many important functions, such as the physical isolation of the range's lead contamination traveling to adjoining spaces, and

maintaining negative pressure within the range, which is necessary to move exhaust gases down range and not into unintended spaces. The physical isolation is also critical to reducing sound transmission between the range, while in operation, and the adjacent areas. Any gains from the best-designed wall could easily be diminished if the passageway is poorly designed. For instance, a single solid core wooden door might have an STC of 28, considerably less than an STC of 72 for the wall described above. Warnock and Quirt²⁷ measured the greatest STC, around 50, for a double door passageway that has either two solid core wood doors or hollow steel doors with a 230 mm space with absorption. A longer passageway almost certainly guarantees that one of the doors will be closed at all times, keeping direct airborne transmission of the impulse sounds to a minimum.

The design of the doors can be improved to provide greater noise reduction. Hongisto et al.^{28,29} developed a theoretical treatment for analyzing transmission through a multilayered door as well as measuring the effective leak of the door seals. The door that provided the best performance (STC of 48) was built with a layer of steel, an absorber, an air gap, another absorber and steel. Substituting the better door for the hollow steel doors on either end of the passageway ought to greatly improve the transmission loss performance of the passage. The seals around the door are critical to maintaining high noise isolation of the range. According to Warnock and Quirt²⁷, the use of a magnetic seal will provide the best performance. The proper installation of doors is also critical to achieve high sound insulation, the doorframe must be well-fitted to the wall with no cracks or leaks, and the gaskets must be well adjusted.

3.2.3 Windows

In several of the ranges studied by NIOSH, the control booths had glass windows that permitted the range master an unobstructed view of the shooters (see Fig. 2). In one of the ranges, the adjoining walls had additional windows to the cleaning room and the passageways. The glass windows were designed to be bulletproof and be able to stop a 0.223 caliber round. Windows usually provide less transmission loss than the surrounding wall. It is always advantageous, from a noise control perspective, to reduce the size of the window as much as possible, or in some cases, eliminate the use of windows altogether if they are not critical to the operation of the range.

Glass, in general, obeys the "Mass Law" principle, where a linear relationship exists between the mass per unit area and the sound transmission loss typically over a range from the panel resonant frequency on the lower end to the one half of the critical frequency on the upper end. Laminated glass functions as a constrained layer damping system. Flexure of the glass plate sets up shearing within the damping layer of the glass. Some laminated glass exhibited transmission loss of 35 to 45 dB in the 500 to 1000 Hz region for an 11 mm thick sample of glass (4 mm glass, 1 mm polymethylmethacrylate layer, 6 mm glass)³⁰. The thickness of two glass laminates should be different to avoid having the same critical frequency for each plate. Ford³⁰ measured the critical frequencies for the 7, 9, and 11 mm laminates to be 4260, 3075, and 2272 Hz, respectively. For a thicker laminate, the critical frequency could very likely fall in the region where the greatest transmission loss is desired. Therefore the design of the window must be carefully analyzed to optimize both safety and transmission loss. The frames and seals around the window are also important to obtaining excellent performance. The use of a lightweight frame can compromise the effort expended in installing laminated glass. In fact, one window layer could be installed in one of the walls and a second window layer in the other wall layer.

Double-glazed windows with at least 3 inches of airspace between the layers have been shown to be effective in reducing measured sound levels inside the control station to be below the NIOSH REL of 85 dBA.

In addition, to minimize vibration transmission from one pane of glass to the next (known as inter-panel resonance effect), the first and second glass layers should differ in thickness by 30–50%, should be mounted in resilient channels, and should be inclined slightly (not parallel) to reduce objectionable reflections. Proper installation and sealing of windows are critical elements to ensure optimum transmission loss performance.

3.2.4 Ventilation systems

Ventilation is the most important engineering control for protection against primary lead exposure in indoor firing ranges. Well-designed supply air and exhaust ventilation systems have been shown to control exposures to lead fumes and dust in firing ranges. However, the proper operation of two separate ventilation systems, several supply and exhaust fans, and the requirement to distribute 50–75 fpm of air at the firing line can generate significant noise inside the firing range and the adjoining areas. NIOSH measurements of ventilation system sound levels inside a firing range ranged from 77 to 84 dBA. Although these levels may not be considered hazardous to hearing, they can impede speech intelligibility and communication among shooters and between the range master and the shooters. In addition, impulse sounds can travel through the piping and duct system from the firing range to the adjoining areas.

Ventilation ducts that provide a direct acoustic path into adjacent spaces can be fitted with acoustic absorptive materials, both to remediate vibrations in the walls of the duct and to absorb noise transmitted along the duct. Duct lagging with 1" or 2" quilted fiberglass acting as decouplers/absorbers have been shown to provide effective noise reduction (STC rating of 26–30) as well as thermal insulation. Special attention must be paid to the maintenance and handling of acoustic absorptive materials to prevent lead dust accumulation. It is also critical that the ventilation systems are properly maintained and serviced regularly to ensure optimum performance.

3.2.5 Flanking paths and leaks

Impulse sound energy can be transmitted from the firing range to the adjacent spaces by flanking paths such as leaks in and around the walls and direct coupling of the structural wall at intersections with the floor, outside walls, and ceilings^{31–34}. Essentially, any air gap that has been designed to minimize structural-borne transmission should not be bridged by any continuous element such as drywall, oriented strand board sheathing, roofing, mechanical connections such as conduit or plumbing, and, if double masonry walls are used, loose mortar, and wall ties. Design considerations should favor building an envelope within the firing range that is separate from the rest of the structure. That is, the floor should be poured on its own foundation and not rigidly coupled to the rest of the building. At the very least, the common wall(s) should have a joint in the floor that will decouple the two spaces. As mentioned above, the roofing elements will likely span across the firing lanes making it possible to design a natural flexible joint between the range and the

adjacent spaces. Bullet traps can be anchored to the floor—not the super-structure of the building—to prevent noise and vibration from being transmitted throughout the building³⁵. The perimeter of the wall or ceiling should be sealed or caulked air-tight to provide an effective acoustic isolation.

Noise leaks occur when high-frequency sounds pass through small openings or cracks in the walls, ceiling, or floor of the firing range. To reduce leaks, openings must be sealed or caulked and holes or cracks must be properly repaired. Because leaks permit mainly high frequency sounds to be transmitted through, the application of sound absorption material and making the sounds travel through a longer path can significantly reduce the effects of leakage. Electrical connections that span between the adjacent spaces and the firing range should have flexible conduit with added length to minimize transmission. The electrical service should make a single crossing and then branch out to outlets and lighting as opposed to making several crossings of the common wall. Outlets, light switches, and electrical boxes on common walls should be offset and sealed airtight to prevent a direct path for noise. Water service may be necessary for cleaning the floor, but washroom and drinking facilities should not be in the range because of the possibility of lead exposure. Plumbing connections should incorporate isolation wherever the supply and waste piping comes in contact with the walls. Flexible hose tubing can connect the sink and faucet to the supply. A rubber boot can isolate the waste line from the exposed mass of the sink.

4 SUMMARY

Noise control solutions focused on improving the sound absorption inside the firing range and minimizing the noise transmission from the firing range to the adjacent spaces would significantly reduce shooting noise. General sound absorption treatment of the firing range walls and ceilings would improve the reverberant environment within the range, and solutions for the construction and treatment of shooting booths should reduce personal noise exposures of the shooters. A range of noise control solutions to reduce sound transmissions to the adjacent areas addressed the construction of the common wall, passageways, windows, and concerns for the potential flanking pathways. It is important to note that the noise control solutions highlighted in this paper are not intended to be comprehensive or universal in application. Indoor firing ranges have differing requirements and specific building codes. Some elements may seem excessive or expensive (double door passageways, double-glazed laminated windows), but the expense of designing and

including these elements up front will certainly be less costly than attempting to retrofit an unusable facility

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ATTACHMENT 10

NATIONAL RIFLE ASSOCIATION OF AMERICA
11250 WAPLES MILL ROAD
FAIRFAX, VIRGINIA 22030



December 12, 2012

Mr. Jacob Belemjian
The Firing Line
1173 Dayton Ave
#103A
Clovis, CA, 93612

Dear Mr. Belemjian,

It has been brought to the attention of the NRA Range Services Department that the NRA Range Source Book is being quoted as a point of reference for range design in a matter of review of a conditional use permit by the city of Clovis to continue operations of your shooting range, The Firing Line.

The purpose of the NRA Range Source Book is reference on page I-5, 1.02.4, Current 2012 Edition, stating the following:

"The purpose of this source book is not, under any circumstances, to act as a substitute for a thorough professional evaluation of a range. Such an evaluation should take into account all of the aforementioned considerations. This source book may not be used in lieu of the evaluation of engineers and architects that are recommended to design a range. The source book is merely provided for the purpose of furnishing certain general engineering, design and other strategies, information and ideas that may be employed, based on the particular circumstances of a particular range, where there is a demonstrated need for such applications. This source book may not be utilized to establish design standards or criteria for ranges."

Furthermore, the following section, page I-6, 2.01.1 states the following:

"The National Rifle Association does specify dimensions for range layout in NRA sanctioned shooting events, but does **NOT** certify or in any way approve ranges or range designs for any purpose. While every effort has been made to provide up-to-date technical information, this Source Book is in no way to be used as a substitute for, or in lieu of, consultation with architects, engineers and attorneys who should be called upon to make specific recommendations for individual range design, construction and use of shooting ranges. The NRA Range Source Book is **NOT** a code book or certification standard, but rather a publication listing general suggestions. Each range is site specific, fact sensitive, and risk driven, and needs to be considered in that light. The National Rifle Association assumes no liability for information contained herein."

It would be the recommendation of the NRA Range Services department that The Firing Line obtain an official NRA Range Case for NRA to make an official assessment of the facility in order to provide information on the health and safety of this facility, and make suggestions for improvements if needed.

The National Rifle Association does not provide information on ranges site unseen and cannot make an official comment at this time regarding The Firing Line. Please note as stated on the previous page, NRA is not a code or standards enforcement agency, and in the event that an official range case is conducted, the information within that report will merely be the suggestions of the Range Technical Team Advisor who is assigned to the case based on the observations on the date of visit and the information provided by the range owner/operator.

If The Firing Line would like to move forward in opening an official range case, the RTTA Request form is enclosed, and is also available online at <http://rangeservices.nra.org/documents/pdf/range/rtta-request.pdf>. Once completed the form may be emailed to range@nrahq.org or mailed to the NRA Range Services Department to begin the case process. Please note, this process typically takes 30-60 days from the time of contract signatures to the date you should expect to receive the final report.

Should any further information be requested, please feel free to contact me directly at (703) 267-1348 or ebush@nrahq.org

Sincerely,



Elizabeth M. Bush
National Manager
NRA Clubs, Associations & Range Services
11250 Waples Mill Road
Fairfax, VA 22030
(703) 267-1348
ebush@nrahq.org

ATTACHMENT 11



December 10, 2012

Mr. Dwight Kroll, AICP
Director of Planning and Development Services
CITY OF CLOVIS
1033 Fifth Street
Clovis, California 93612

RE: THE FIRING RANGE NOISE LEVELS

Dear Mr. Kroll:

As requested, Brown-Buntin Associates, Inc. (BBA) has conducted a noise study to determine the existing ambient noise environment in the vicinity of The Firing Range (range) located at 1173 Dayton Avenue in Clovis. The study included conducting long-term noise measurements using automated equipment at a location adjacent to the range and hand-held measurements at two locations in the neighborhood north of the range. Measured noise levels were compared to applicable City of Clovis noise standards. The following letter report summarizes our findings.

The noise level descriptors used in this analysis are described in Appendix A. The primary descriptor utilized is the Community Noise Equivalent Level (CNEL). The CNEL is the time-weighted energy average noise level for a 24-hour day, with a penalties of 5 dB added to noise levels occurring during the evening hours (7:00 p.m.-10:00 p.m.) and 10 dB added to noise levels occurring during the nighttime hours (10:00 p.m.-7:00 a.m.). The CNEL is utilized by the City of Clovis in its Noise Element of the General Plan for noise compatibility planning purposes. The city's exterior noise level standard is 65 dB CNEL.

Appendix B provides examples of noise levels from a variety of familiar sources along with a ranking of subjective loudness. The chart is useful when making a relative comparison of the maximum intermittent noise levels reported by this analysis to noise generated by other common sources within a developed area.

According to the City of Clovis, the approved hours of operation for The Firing Range are from 9:00 a.m. to 10:00 p.m. Monday through Friday, and from 9:00 a.m. to 8:00 p.m. Saturday and Sunday. According to The Firing Range website, the range was closed for maintenance from 3:00 p.m. Sunday, November 11th through Wednesday, November 14th. This allowed for the collection of ambient noise monitoring data with and without noise level contributions from shooting at the range.

----- Ambient Noise Level ----- Maximum Noise Level ----- Aircraft Noise Level ----- Environmental Noise Assessment -----

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Automated noise monitoring equipment was utilized to conduct long-term noise measurements for a week-long period beginning at approximately 10:00 a.m. on November 9, 2012. The long-term monitoring site was located adjacent to and east of the range, as shown in Figure 1, and was intended to document overall ambient noise levels in the area, including contributions from the range. Noise monitoring equipment consisted of a Larson-Davis Laboratories Model 820 analyzer equipped with a Bruel & Kjaer (B&K) Type 4176 microphone. The equipment was calibrated prior to use using a B&K Type 4230 acoustic calibrator to ensure the accuracy of the measurements. The microphone was located on a boom at approximately 12 feet above the ground and had an unobstructed view of the building where the range is located.

The automated noise monitor ran continuously during the week-long noise monitoring period, and measured noise from all sources affecting the monitoring site. The Noise sources observed to affect the monitoring site included local and distant traffic, aircraft operations and nearby commercial activities, including the range.

Table I provides a summary of the ambient noise level data collected by the automated noise monitor. Reported are the equivalent sound level (L_{eq}), maximum sound level (L_{max}) and level exceeded 90 percent (L_{90}) of the time for each measurement day. The L_{90} is a statistical noise descriptor that is used to characterize background (or residual) noise levels in the absence of identifiable noise events. Also included in Table I are calculated CNEL values for each full 24-hour noise measurement day.

As described above, and noted in Table I, the range was closed for maintenance from 3:00 p.m. November 11 through November 14. The highest CNEL values for the measurement period generally occurred on days when the range was closed.

TABLE I						
SUMMARY OF AMBIENT NOISE LEVEL MEASUREMENTS EAST OF THE FIRING RANGE, CLOVIS						
Date	Measurement Period	Day	A-weighted Decibels, dBA			
			Hourly L_{eq}	Hourly L_{max}	Hourly L_{90}	CNEL
11/9/12	10 a.m.-midnight	Friday	40.7-65.3	58.5-93.8	37.2-49.2	N/A
11/10/12	midnight-midnight	Saturday	38.0-61.6	51.6-81.2	34.7-49.3	55.9
11/11/12 ¹	midnight-midnight	Sunday	39.6-62.8	53.2-88.8	35.3-49.2	57.1
11/12/12 ¹	midnight-midnight	Monday	44.4-66.9	58.8-89.4	40.7-51.1	59.1
11/13/12 ¹	midnight-midnight	Tuesday	45.3-59.9	51.6-85.5	39.6-51.7	59.6
11/14/12 ¹	midnight-midnight	Wednesday	45.3-76.2	56.4-99.9	39.5-51.4	64.4
11/15/12	midnight-midnight	Thursday	44.4-59.9	59.1-86.4	39.4-53.2	58.7
11/16/12	midnight-2 p.m.	Friday	45.5-55.8	61.3-82.3	37.9-51.3	N/A
¹ The Firing Range was closed from 3:00 p.m. 11/11/12 through 11/14/12						
Source: Brown-Buntin Associates, Inc						

The automated noise monitor was also programmed to collect noise level data during individual noise events. For this study, a minimum noise level of 65 dBA and a minimum duration of 5 seconds were used as thresholds to define individual noise events. This means that, in order for a noise event to have been identified and measured during the study, the noise level had to *exceed* 65 dBA for at least 5 seconds. A total of 276 events were identified by the automated noise monitoring equipment during the study period.

Table II summarizes the noise events identified by the automated noise monitor in terms of the day they occurred, the number of events and the range of recorded maximum noise levels. Since an observer was not present during the long-term noise measurement period, it was not possible to specifically identify the sources that may have caused the identified noise events. As will be further described, it is unlikely that any of the events identified by the automated noise monitoring equipment were caused by shooting activities at The Firing Range.

The most likely source of the highest noise levels recorded by the automated equipment was aircraft operations at nearby Fresno-Yosemite International Airport. Such events generally coincided with the times of day that the California Air National Guard F-16 aircraft take off and land at the airport.

Hand-held noise measurements were conducted by a trained observer between 3:00 p.m. and 4:00 p.m. on November 16, 2012 at the automated noise monitoring location and at two additional locations noted on Figure 1 as ST1 and ST2. The purpose of the hand-held noise measurements was to specifically identify the noise levels generated by shooting activities at The Firing Range in the nearby neighborhood. ST1 was located near the corner of Fedora and Manila Avenues and ST2 was located near the corner of Fedora and Eddy Avenues.

At the automated noise monitor location, noise levels generated by shooting activities at the range were observed by BBA to be in the range of 55-60 dBA. At Sites ST1 and ST2, noise levels generated by shooting activities at the range were observed by BBA to be in the range of 45-48 and 48-52 dBA, respectively. The noise levels measured at Sites ST1 and ST2 are consistent with those measured at the automated noise monitor site when additional distance and partial acoustic shielding by intervening houses are taken into consideration. At no time during the hand-held noise measurements were noise levels from the range observed by BBA to exceed 65 dBA.

Ambient noise measurements obtained over a week-long period indicated that noise exposure due to all sources in the neighborhood north of The Firing Range is in the range of 56-64 dB CNEL. Such levels do not exceed the City of Clovis 65 dB CNEL standard. As noted above, the highest CNELs occurred during days when the range was not in operation.

TABLE II SUMMARY OF AUTOMATED SINGLE EVENT NOISE MEASUREMENT RESULTS EAST OF THE FIRING RANGE, CLOVIS				
Date	Measurement Period	Day	Number of Events Over 65 dBA	Range of Maximum Levels, dBA
11/9/12	10 a.m -midnight	Friday	29	65.6-93.8
11/10/12	midnight-midnight	Saturday	30	66.0-81.2
11/11/12	midnight-3:00 p.m	Sunday	27	66.1-84.3
11/11/12 ¹	3:00 p.m -midnight	Sunday	8	67.7-79.8
11/12/12 ¹	midnight-midnight	Monday	24	65.5-89.4
11/13/12 ¹	midnight-midnight	Tuesday	49	65.5-85.5
11/14/12 ¹	midnight-midnight	Wednesday	58	65.0-99.9
11/15/12	midnight-midnight	Thursday	31	65.5-86.4
11/16/12	midnight-2 p.m	Friday	20	65.7-82.3
¹ The Firing Range was closed Source: Brown-Buntin Associates, Inc.				

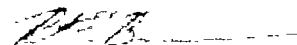
It is concluded that the noise levels generated by The Firing Range are at times clearly audible in the neighborhood to the north of the range, but that such levels do not exceed the city's 65 dB CNEL standard.

The foregoing analysis is based upon the best information known to Brown-Buntin Associates, Inc. (BBA) at the time of preparation. Any significant changes in the design or proposed use of The Firing Range or the use of firearms that are larger (noisier) than observed at the time of the study could change the findings and conclusions of the analysis.

Please contact me at 559-627-4923 or rbrown@brown-buntin.com if there are questions or additional information is required.

Respectfully submitted,

BROWN-BUNTIN ASSOCIATES, INC.



Robert E. Brown
 President

REB:reb

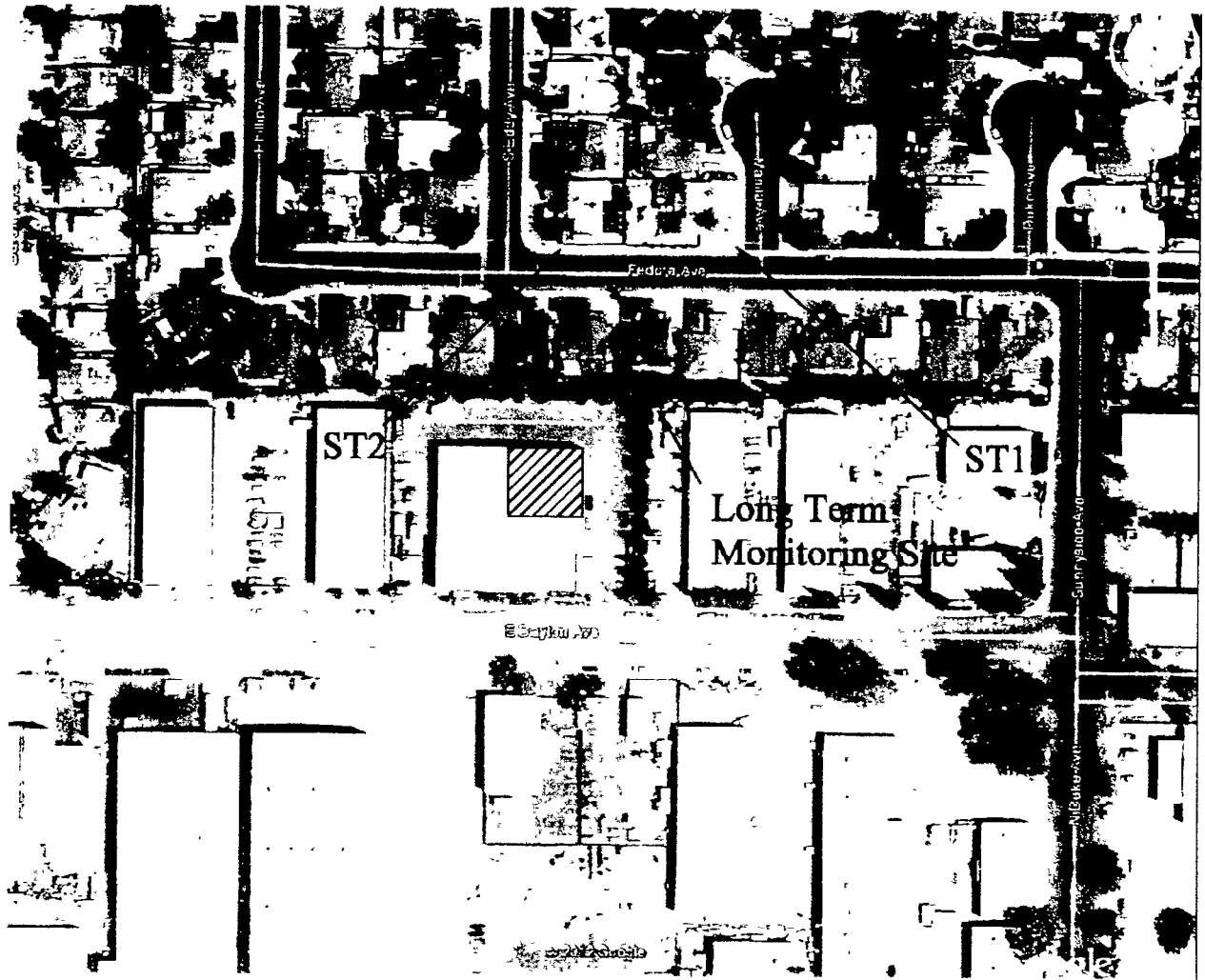


Figure 1: Study Area and Noise Monitoring Sites

APPENDIX A

ACOUSTICAL TERMINOLOGY

AMBIENT NOISE LEVEL:	The composite of noise from all sources near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.
CNEL:	Community Noise Equivalent Level. The average equivalent sound level during a 24-hour day, obtained after addition of approximately five decibels to sound levels in the evening from 7:00 p.m. to 10:00 p.m. and ten decibels to sound levels in the night before 7:00 a.m. and after 10:00 p.m.
DECIBEL, dB:	A unit for describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
DNL/L_{dn}:	Day/Night Average Sound Level. The average equivalent sound level during a 24-hour day, obtained after addition of ten decibels to sound levels in the night after 10:00 p.m. and before 7:00 a.m.
L_{eq}:	Equivalent Sound Level. The sound level containing the same total energy as a time varying signal over a given sample period. L_{eq} is typically computed over 1, 8 and 24-hour sample periods.
NOTE:	The CNEL and DNL represent daily levels of noise exposure averaged on an annual basis, while L_{eq} represents the average noise exposure for a shorter time period, typically one hour.
L_{max}:	The maximum noise level recorded during a noise event.
L_n:	The sound level exceeded "n" percent of the time during a sample interval (L_{90} , L_{50} , L_{10} , etc.). For example, L_{10} equals the level exceeded 10 percent of the time.

ACOUSTICAL TERMINOLOGY

NOISE EXPOSURE CONTOURS:

Lines drawn about a noise source indicating constant levels of noise exposure. CNEL and DNL contours are frequently utilized to describe community exposure to noise.

NOISE LEVEL REDUCTION (NLR):

The noise reduction between indoor and outdoor environments or between two rooms that is the numerical difference, in decibels, of the average sound pressure levels in those areas or rooms. A measurement of Noise level reduction combines the effect of the transmission loss performance of the structure plus the effect of acoustic absorption present in the receiving room.

SEL or SENEL:

Sound Exposure Level or Single Event Noise Exposure Level. The level of noise accumulated during a single noise event, such as an aircraft overflight, with reference to a duration of one second. More specifically, it is the time-integrated A-weighted squared sound pressure for a stated time interval or event, based on a reference pressure of 20 micropascals and a reference duration of one second.

SOUND LEVEL:

The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the response of the human ear and gives good correlation with subjective reactions to noise.

SOUND TRANSMISSION CLASS (STC):

The single-number rating of sound transmission loss for a construction element (window, door, etc.) over a frequency range where speech intelligibility largely occurs.

APPENDIX B EXAMPLES OF SOUND LEVELS

NOISE SOURCE	SOUND LEVEL	SUBJECTIVE DESCRIPTION
AMPLIFIED ROCK 'N' ROLL *	120 dB	DEAFENING
JET TAKEOFF @ 200 FT *		
	100 dB	VERY LOUD
BUSY URBAN STREET *		
	80 dB	LOUD
FREEWAY TRAFFIC @ 50 FT *		
	60 dB	MODERATE
CONVERSATION @ 6 FT *		
TYPICAL OFFICE INTERIOR *	40 dB	FAINT
SOFT RADIO MUSIC *		
	20 dB	VERY FAINT
RESIDENTIAL INTERIOR *		
WHISPER @ 6 FT *		
HUMAN BREATHING *	0 dB	

ATTACHMENT 12



January 24, 2013

Mr. Dwight Kroll, AICP
Director of Planning and Development Services
CITY OF CLOVIS
1033 Fifth Street
Clovis, California 93612

RE: PHASE TWO NOISE STUDY FOR THE FIRING RANGE IN CLOVIS

Dear Mr. Kroll:

As requested by the City of Clovis, Brown-Buntin Associates, Inc. (BBA) has completed the second phase of a noise study at the Firing Range (range) located at 1173 Dayton Avenue in Clovis. The study included a tour of the range facility, detailed noise measurements within and near the building within which the range is located and the preparation of recommendations for further reducing noise levels generated by the range. The following letter report summarizes our findings.

A tour of the range with city officials and the range owner was conducted on January 10, 2013. The purpose of the tour was to provide information to BBA and the city about how the building was modified in conformance with recommendations from the National Rifle Association (NRA) for safety and noise suppression. In essence, a solid concrete enclosure approximately 10 feet high was constructed within the existing insulated steel building and wood-covered steel baffles were installed over the top of the concrete walls to contain fired bullets. A wood-framed sound reduction wall was constructed between the top of the concrete wall and the ceiling of the steel building. The sound reduction wall consists of Tectum® over soundboard and fiberglass insulation. Bullets are fired into a specialized trap consisting of steel plates and a rubberized fill material. There are two large roll-up doors located on the east side of the building. Significant modifications to the exterior building shell were not apparent.

At the request of the owner, BBA conducted noise measurements within the range approximately 6 feet behind and at a 45° angle from a shooter while rounds were fired from a representative sample of the handguns typically used at the facility. Each handgun was fired three times with about one second between shots, and the maximum A-weighted sound level was recorded. The sound level meter was set for "fast" meter response as is customary for the measurement of impulsive type sounds that have a rapid onset and decay. Recorded sound level data are summarized in Table I. As expected, the .22 produced the lowest noise levels and the .357 Magnum produced the highest noise levels.

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TABLE I SUMMARY OF INDOOR NOISE MEASUREMENT RESULTS INSIDE RANGE AT APPROXIMATELY SIX FEET BEHIND SHOOTER JANUARY 10, 2013	
HANDGUN CALIBER	Maximum Sound Level, dBA (Fast)¹
22	120 2
9 mm	123 6
.38	121 6
.40	123 3
.45	123 0
357 Mag.	125 1
¹ Fast meter response is typically used to measure impulsive type noise sources	
Source Brown-Buntin Associates, Inc.	

Outdoor noise measurements were conducted at various locations around the north and east sides of the building to determine the best location to conduct detailed noise measurements of the above-referenced representative sample of handguns. It was noted during the survey that noise from gunshots appears to mostly originate from the upper walls of the building and from around the upper portion of the southernmost roll-up door on the east side of the building. It was also noted that sound from gunshots is reflected from the existing buildings to the east of project site.

It was determined that the best location for detailed noise measurements was approximately 60 feet northeast of the northeast corner of the building (about 15 feet from the northern property line). This location had an unobstructed view of the building within which the range is located and provided access for a city-owned boom truck. The boom truck was used to conduct noise measurements above the height of the block wall along the northern boundary of the project site. The reference noise measurement site is noted on Figure 1.

Table II summarizes the data obtained during the detailed outdoor noise measurements at approximately 5 feet above the ground and at approximately 12 feet above the ground. The same handguns were fired as described above for the indoor noise measurements. Three shots were fired from each gun. Again, the highest maximum sound level was produced by the .357 Magnum. As shown by Table II, there was no significant difference between the noise levels

recorded at 5 feet and 12 feet above the ground. It was noted during the outdoor noise measurements that “fast” meter response produced measured noise levels that were about 2 dB higher than “slow” meter response. Slow meter response is used for the measurement of most community noise sources, including traffic, aircraft and most commercial/industrial activities.

<p>TABLE II</p> <p>SUMMARY OF OUTDOOR NOISE MEASUREMENT RESULTS</p> <p>SIXTY FEET NORTHEAST OF BUILDING</p> <p>JANUARY 10, 2013</p>		
HANDGUN CALIBER	Maximum Sound Level, dBA (Fast)	
	@ 5 feet AGL	@ 12 feet AGL
22	55.2	55.8
9 mm	63.2	63.5
38	60.9	60.5
40	59.8	60.5
45	61.8	62.2
357 Mag.	68.6	67.8
Source: Brown-Buntin Associates, Inc.		

Noise measurements were also conducted in the neighborhood to the north of the range near the intersection of Fedora and Manila Avenues. Using fast meter response, maximum noise levels from the .357 Magnum were approximately 55 dBA. Noise levels from shots fired by other handguns were occasionally audible but accurate measurements were not possible due to interference from other noise sources in the area.

It was concluded in BBA’s report dated December 10, 2012 that noise levels generated by the Firing Range are audible in the neighborhood to the north of the range but do not exceed the 65 dB CNEL standard of the city’s noise element. The CNEL and the similar DNL descriptors are recommended by the State of California for land use compatibility planning around transportation noise sources including roadways, airports and railroads. Such standards are used in virtually all noise elements within the state. However, the CNEL is not effective for assessing noise compatibility around more intermittent sources of noise such as a firing range.

Some jurisdictions have adopted noise ordinances that are intended to address noise from commercial or industrial sources that are not exempt from local control by existing federal or state regulations. An example of such an ordinance is the Fresno County Noise Ordinance (Chapter 8.40 of the Fresno County Ordinance Code). The ordinance addresses the statistical distribution of noise during any individual hour of the day and allows for progressively shorter periods of exposure to levels of increasing loudness. The ordinance is more restrictive during the nighttime hours of 10:00 p.m. to 7:00 a.m.

The county's noise ordinance is 5 dB more restrictive for noise sources that are impulsive in nature or consist primarily of speech or music. The ordinance also requires that impulsive type sounds be measured using "fast" meter response. The county's maximum noise level standard for impulsive type sounds during the daytime hours (7:00 a.m.-10:00 p.m.) is 65 dBA.

Reference to Table II shows that maximum noise levels measured inside the project site at approximately 15 feet from the northern property line were less than 65 dBA for all guns except the .357 magnum. That gun produced maximum noise levels of 68.6 dBA at 5 feet above the ground and 67.8 dBA at 12 feet above the ground. It is estimated that maximum noise levels from the .357 Magnum would be at or less than 65 dBA at the closest homes north of the project site. Such levels would marginally comply with the standards of the county's noise ordinance when other existing sources of noise are taken into consideration (noise from traffic and aircraft frequently exceed 65 dBA in the neighborhood).

The January 10, 2013 tour of the Firing Range demonstrated that the owner has taken significant steps to reduce noise emanating from the range. However, it was also determined that there are additional cost-effective actions that could be considered to further reduce noise exposure within and near the range. It is assumed that it would not be feasible to consider significant modifications to the existing metal building due to the high cost that would be associated with such modifications.

Noise levels within the range and affecting nearby homes could be reduced by adding acoustical absorption to the closest walls and ceiling down range from the firing booths. The most effective treatment would be to install one inch-thick Tectum® over 2"x furring strips with 2 ½ inch-thick fiberglass insulation (R-8) between the furring strips (C-40 mounting). This would significantly reduce the early reflections of sound produced by gunfire in the 250-1000 Hz frequency range. Gunfire contains significant acoustical energy with this frequency range and most acoustical materials do not perform well at those frequencies if they are not installed as described above.

Acoustical absorption could also be considered for the floor down range from the firing booths. A major concern is lead contamination, so the treatment would need to be cleanable. As with the above-described wall and ceiling treatment, the best acoustical performance would occur if the

Mr. Dwight Kroll, AICP
Director of Planning and Development Services
CITY OF CLOVIS
January 24, 2013
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treatment has a depth of 1 ½ inches or more. Cleanable rubber mats are available for athletic facilities or commercial kitchens that would be suitable for this use. Walkable and cleanable rubber mats could also be utilized behind the shooting booths to reduce reflected sound in the area where persons stand while shooting or waiting to shoot.

With regard to acoustical flanking paths (acoustical leaks) in the building shell, it was noted that noise from gun shots seemed to leak around the upper portion of the southernmost roll-up door on the east side of the building. If the door does not need to be opened on a regular basis, it could either be sealed or modified to eliminate that potential source of sound.

Please contact me at 559-627-4923 or rbrown@brown-buntin.com if there are questions or additional information is required.

Respectfully submitted,

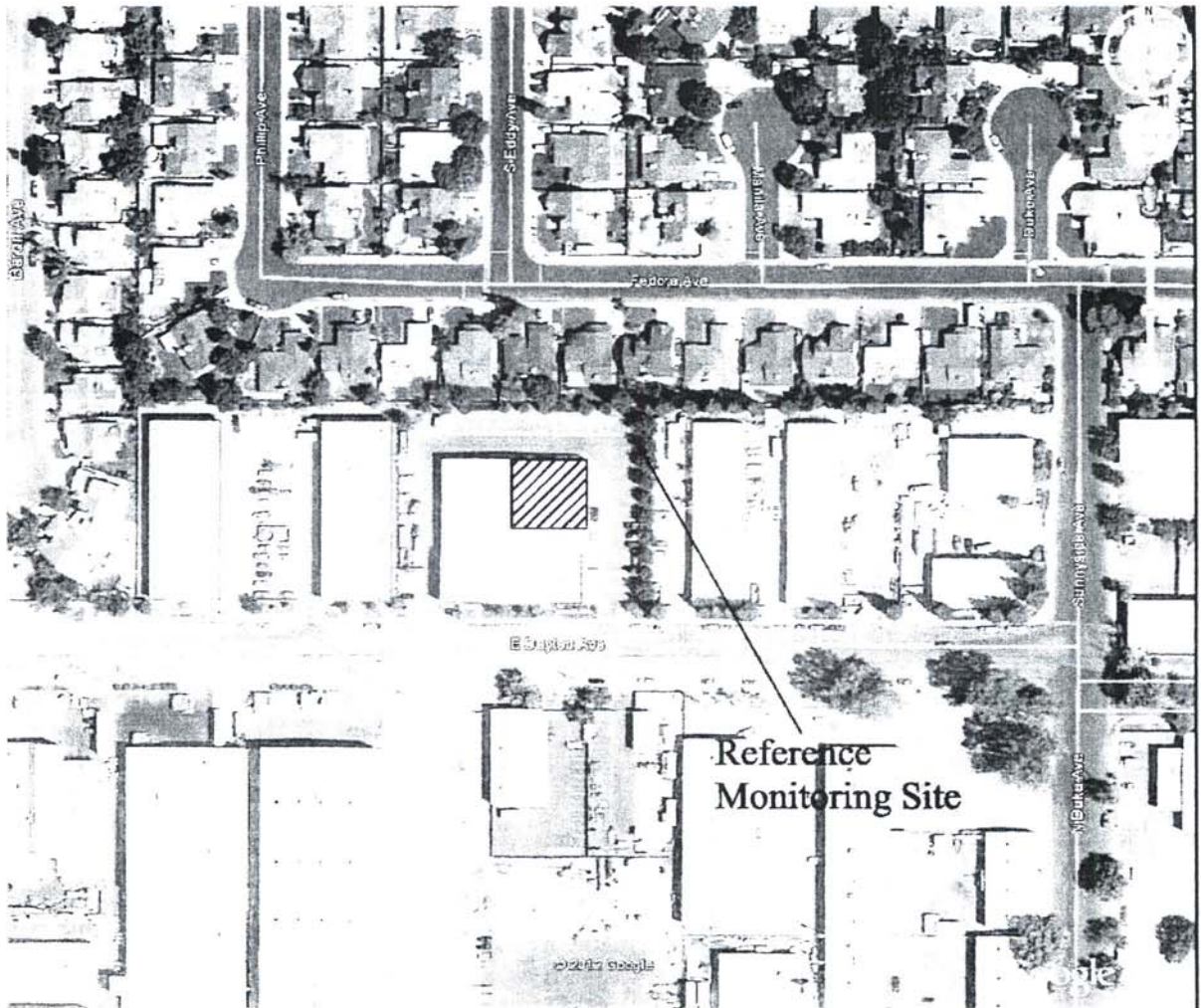
BROWN-BUNTIN ASSOCIATES, INC.



Robert E. Brown
President

REB:reb

Figure 1: Project Site and Reference Noise Monitoring Site



ATTACHMENT 13

RANGE DESIGN CRITERIA



**U.S. DEPARTMENT OF ENERGY
Office of Health, Safety and Security**

AVAILABLE ONLINE AT:
<http://www.hss.energy.gov>

INITIATED BY:
Office of Health, Safety and Security

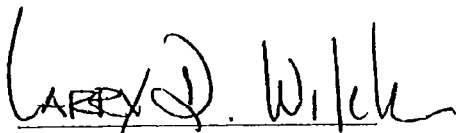
Notices

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Local DOE management is responsible for the proper execution of firearms-related programs for DOE entities. Implementation of this document's provisions constitutes only one segment of a comprehensive firearms safety, training, and qualification program designed to ensure that armed DOE protective force personnel are able to discharge their duties safely, effectively, and professionally. Because firearms-related activities are inherently dangerous, proper use of any equipment, procedures, or techniques etc., identified herein can only reduce, not entirely eliminate, all risk. A complete safety analysis that accounts for all conditions associated with intended applications is required prior to the contents of this document being put into practice.

CERTIFICATION

This document contains the currently-approved firearms "Range Design Criteria" referred to in DOE O 473.3, *Protection Program Operations*.

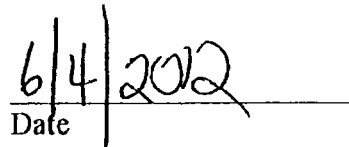
A handwritten signature in black ink, appearing to read "Larry D. Wilcher", written over a horizontal line.

Larry D. Wilcher

Director

Office of Security

Office of Health, Safety and Security

A handwritten date "6/4/2012" written in black ink over a horizontal line.

Date

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ATTACHMENT 1 -- RANGE DESIGN FIGURES	Attachment 1-1

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RANGE DESIGN CRITERIA

1. PURPOSE. This document contains design criteria for U.S. Department of Energy (DOE) live-fire ranges for use in planning new facilities and major rehabilitation of existing facilities. This document will be approved and maintained by the Office of Security, Office of Health, Safety and Security (HSS) as a stand-alone document on the HSS website: <http://www.hss.doe.gov/SecPolicy/pfs.html>.
2. PLANNING FACTORS. All applicable local, State, Federal, U.S. Environmental Protection Agency, Occupational Health and Safety Administration (OSHA), and National Environmental Policy Act requirements should be addressed and be reviewed annually (at least every 12 months) by the site to incorporate any requirements and/or changes that occur.
3. PLANNING OVERVIEW.
 - a. General Considerations.
 - (1) Live-fire range design should: (a) promote safe, efficient operation; (b) include provisions for ease of maintenance; and (c) be affordable to construct and maintain.
 - (2) Live-fire ranges should be designed to prevent injury to personnel and to prevent property damage outside the range from misdirected or accidental firing and ricochets. They should also be designed to direct ricochets away from the firing line inside the range.
 - (3) An open range may be established provided that enough distance and land area available to allow for surface danger zones (SDZs) appropriate for the weapons to be used. Lack of SDZs may require baffled ranges. Extreme weather conditions may necessitate indoor ranges.
 - b. Type of Range.
 - (1) Range requirements should be considered when determining the type and size of the range and the material to be used.
 - (2) The range should be suitable for training and qualifications for all courses of fire used on the site as set forth in the HSS-approved Firearms Qualification Courses.
 - (3) The range should be designed for shooting day and reduced-lighting DOE firearms courses, moving targets, multiple targets, and advanced shooting courses/activities (e.g., shooting at steel targets) that may be required by the site.

- (4) When determining whether the facility will be an indoor, open outdoor, partially baffled, or fully baffled range, the decision-making process should include site weather conditions, available land, available funding, and environmental, safety, and health considerations. The following additional factors should be considered.

- (a) How many shooters must be accommodated?
- (b) Will emphasis be on training or competitive activities?
- (c) What types of firearms and range of ammunition will be used? (See Table 1.)
- (d) Will the facility be used exclusively by DOE or will it be open to other organizations?
- (e) What special uses will be made of the facility; e.g., advanced training, special weapons, or explosives?
- (f) What lighting will be required, and what lighting is desired?
- (g) What administrative space will be needed?
- (h) What types of target mechanisms will be used?
- (i) Will spectator safety areas be needed?
- (j) What types of acoustics will be needed?
- (k) How will lead contamination be controlled?
- (l) Where will bullet traps be needed?
- (m) Where will firearms cleaning and maintenance be performed?

- c. Site Selection Preparation. The site selected should accommodate the required facility. It should meet acceptable standards for safety and have sufficient space, access, and acceptable zoning and construction costs. Land acquisition costs, future land values, and possible restrictions should also be examined. To ensure the project is feasible the following data should be considered.

- (1) Documents. Copies of specific site, environmental, and construction criteria; applicable mandated regulations from Federal, State, county, and local authorities; copies of ordinances, zoning regulations, soil conservation standards, health department requirements, and any other regulations that may pertain to the project should be obtained.

- (2) Alternate Sites. Identify alternate sites, because one or more of the potential sites may be unsuitable or construction costs may be prohibitive.
 - (3) Technical Data. Gather technical data relevant to each site including zoning maps, aerial photographs, topographic maps, and onsite ground and aerial information.
- d. Considerations. The criteria to be considered in this process are:
 - (1) environmental restrictions; e.g., Endangered Species Act, Wilderness Act, and air and water pollution criteria;
 - (2) access; e.g., is it adequate or should a roadway be constructed to the site;
 - (3) construction cost; e.g., berms, baffles, barriers, earth moving;
 - (4) other restrictive Federal or State statutes and local ordinances; and
 - (5) community growth, especially in areas where urban growth is rapid. Escalating property values may make it unwise to construct in a particular area.
- e. Preliminary Design Stage.
 - (1) Prepare:
 - (a) a preliminary layout sketch of each site;
 - (b) a draft document, which should include specifications for applicable zoning, building codes, environmental, safety, and health considerations, and other pertinent restrictions;
 - (c) alternative preliminary site plans showing different range layouts;
 - (d) a planning cost estimate; and
 - (e) a risk analysis report.
 - (2) Submit all environmental, zoning and building permit applications for approval. Be prepared, via the draft document, to present and, if necessary, defend the proposal at public hearings before zoning boards, health officials, and other governmental bodies involved in issuing permits.
- f. Final Design Stage.
 - (1) The preliminary site plans include a layout of the proposed range with its accompanying safety fan in a cross section and top view.

- (2) The range master/manager, training manager, safety manager, industrial hygienist, appropriate operating personnel and public works engineer should review and approve the design requirements during the planning phase, before the construction drawings are started, and during the construction phase.

4. OUTDOOR RANGE DESIGN.

a. Site Selection.

- (1) Outdoor range sites should be remote from other activities but accessible by road. SDZs should not extend across traveled roads, navigable waterways, railroads, or other areas.
- (2) To protect against unauthorized access, SDZs should be controlled while firearms are being discharged. To prevent future encroachment, SDZs should be recorded on site maps.
- (3) If other methods to control access to SDZs are not effective, then the zones should be fenced in. Natural barriers around the site; e.g., rivers, hills or a large drainage channel may be used to prevent encroachment and will ensure privacy. The best site is one with a natural backstop for projectiles to reduce the cost of constructing earth impact berms and to provide natural sound abatement.
- (4) Outdoor ranges should be oriented to eliminate firing into the sun. The range should be oriented to the north or slightly to the northeast. The ideal direction is between due north and 25° northeast.

b. Range Planning.

- (1) Firing into upward sloping land and land with natural backstops of hills or mountains is recommended.
- (2) Firing platforms, access roads, and targets should be elevated above the flood level.
- (3) The line of fire in rough terrain should be perpendicular to high ground. The line of fire on flat terrain should be free of knolls, ridges, and trees that reduce visibility.
- (4) Known distance ranges should be as flat or evenly graded as possible. If the grade between the firing points and target does not exceed 2 percent, then the firing points may be below the target.
- (5) Roads used for setting and servicing targets in impact areas and for maintenance of earth berm may be graded pathways. Roads in areas not subject to disturbance; e.g., vehicle parking areas, and roadways behind

5. INDOOR RANGE DESIGN.

a. Use of Indoor Ranges.

- (1) Indoor ranges must be designed so projectiles cannot penetrate the walls, floor or ceiling, and ricochets or back splatter cannot harm range users. Considerations should be made for cleaning of all surfaces and handling of hazardous wastes.
- (2) Lead exposure requirements must be reviewed for applicability.

b. Site Selection.

- (1) Walls and Partitions. Indoor ranges must incorporate walls and partitions capable of stopping all projectiles fired on the range by containing or redirecting bullets to the backstop.
- (2) Existing Buildings. If there are existing drawings of the facility, copies should be obtained from the original owner, architect, engineer, builder, or building permit. If original drawings of the building are not available, a sketch can be made of each floor of the building with a special emphasis on the load-bearing walls. The following considerations should be used when making the initial evaluation of an existing building.
 - (a) General Construction. Buildings constructed of wood products should be avoided. Modifications to reinforce the structure to support metal backstops or to reduce fire hazards may not be cost-effective.
 - (b) Exterior Walls. The type of exterior wall construction (e.g., masonry, wood, concrete, metal, combination, other) should be identified. Masonry buildings should be given primary consideration, especially those constructed on concrete slabs.
 - (c) Floors, Walls, and Ceilings. Floors, walls, and ceilings must be able to contain the sound in addition to the bullet fired.
 - 1 The ideal wall is made of poured concrete a minimum of 6 inches thick.
 - 2 To aid in range cleaning, concrete floors should be finished so they have a nonporous surface.
 - 3 Ceilings should be 8 feet high and enclosed to reduce air turbulence created by ventilation systems.
 - 4 Evaluate the structural support designs of older buildings for their ability to withstand new loading. Original design

considerations usually do not allow for installing heavy backstops and other range equipment.

- 5 To decide if modifications are necessary, slab buildings must be analyzed carefully to determine the capacity for floor loading. If there are no floor drains and it is economically feasible, modifications should also include adding one or more floor drains.
 - 6 Ceiling joists may require strengthening to support baffles and shielding material.
 - (d) Electrical. Electrical needs may require the installation of heavy-duty wiring both internally and externally to accommodate the added power needs of range ventilation, heating, lighting, and target-carrier mechanisms.
 - (e) Plumbing. Plumbing does not usually require major modifications; however, heavy metals may be prohibited from area wastewater treatment collection systems. Therefore, an approved filtration system may be necessary for disposal of hazardous waste material; e.g., lead.
- (3) Precast Buildings.
- (a) Precast concrete companies can provide complete precast buildings (job site-delivered) if engineering specifications for steel placement are provided on a set of plans (drawings) for the proposed building.
 - (b) Precast assembly allows for installation of a roof design more suitable for an indoor range. Gabled or hip roof designs should not be used.
 - (c) Hollow, precast concrete panels provide an option to bar joists, eliminating bullet ricochet or splatter. A flat bar joist design is the recommended alternative to hollow, precast concrete panels.
 - (d) The flat roof design also provides support for heating, ventilating, and air conditioning (HVAC) equipment outside of the range, which saves space and reduces cost.
- (4) New Construction. New indoor construction projects require the same guidelines as existing buildings; however, they offer the advantage of building a structure specifically for use as an indoor shooting range.

- c. Range Planning. Design work for ventilation, wall structures, floors, ceiling, acoustics, backstops, and lighting will depend on how the range will be used.
 - (1) A determination for the type of building required includes the following considerations.
 - (a) Can the range be built in an existing building or is a new one required?
 - (b) How large should it be?
 - (c) How many shooters will it be expected to serve?
 - (d) Will it be used for competition?
 - (e) Should space be allowed for classrooms?
 - (f) How much will the facility cost?
 - (2) The planning process should include:
 - (a) obtaining ordinances, zoning regulations, building codes, soil conservation regulations and other information pertaining to legal requirements;
 - (b) for evaluation, identifying a site for a new building or several existing buildings that may have the suitable design characteristics; and
 - (c) gathering other technical information relevant to the project. This information includes zoning requirements, onsite information, and range design criteria. Local zoning codes or health department regulations normally will provide answers or solutions on how the project is to be handled.
- d. Design Criteria. Based on the site selected, type of shooting, number of users, and site layout, the next step is to design the facility by preparing detailed drawings showing specifications and necessary dimensions. The four main considerations for indoor ranges are shooter needs, type of shooting activity, number of firing points, and number of users. Special consideration should be given to ventilation, lighting, safety baffles, and backstop design. The following standard and optional features for indoor ranges should be considered.
 - (1) Backstops and Outdoor Baffled Bullet Stops. See "Use of Bullet Traps and Steel Targets" for Shoot House bullet trap information.

- (a) The design of a backstop or baffled bullet stop is a contributing factor to the service life of the unit. Steel should be installed according to the type of ammunition to be used and to proven angle configurations.
- (b) The design criteria should be based on the planned use of the facility. Metal plates selected for use in a backstop or baffled bullet stops must resist repeated stress according to the degree of stress applied. Necessary characteristics are resistance to abrasion, resistance to penetration, surface hardness, thickness, and alloyed strength to resist metal fatigue.
- (c) The main backstop is generally a fabricated steel plate or series of plates used to stop bullets fired on a range. Backstop configurations and plate thickness will change according to type of shooting activity.
- (d) Steel backstops with sand or water pits are common; however, a few indoor ranges use earthen or sand backstops.

CAUTION: Earthen or sand-filled backstops are not recommended because they can create health hazards for maintenance workers from silica and lead dust. They also cause excessive wear on ventilation fans.

- (e) Backstops must extend from side to side and from ceiling to floor to protect the end of the range completely from penetration by direct bullet strike and prevent ricochets, back splatter, and splatter erosion of side walls.
- (f) Four basic backstop designs are used for indoor ranges: Venetian blind, escalator, Lead-a-lator[®], and the angled backstop (45°) back plate. Other backstop designs exist and should be researched for applicable use.

1 Venetian Blind Backstop. Requires less space, but without proper installation and regular maintenance it can cause back splatter problems from exposed edges of each main segment of the backstop. Keeping the exposed edges ground to original specifications is time-consuming, difficult, and requires skilled personnel.

- a To control back splatter, a curtain should be hung in front of the backstop. Tests have been conducted on materials including canvas, burlap, cardboard, insulation board, and synthetic rubber. Properly installed, these materials effectively stop back

splatter. Walls using insulation board or a synthetic rubber curtain are best.

- b The main advantage of the venetian blind backstop is minimal space requirements. While an angled plate or an escalator will use 14 feet of space, the venetian blind uses only 5 feet.

2 Escalator Backstop. Sets up with flat steel plates laid out on a framework sloping away from the shooter. Between each series of plates, an offset allows a bullet sliding down the facing surface to drop into a hidden tray for easy cleanup. At the top or back of the backstop, a swirl chamber is provided to trap the bullets or bullet fragments as they exit the backstop surface. Once the bullet's flight ends in a spin-out chamber, the bullet or pieces fall into a cleanup tray.

3 Lead-a-lator[®]. A variation of the escalator-type backstop that uses a curved instead of flat piece of steel. The surface is concave and operates so that a bullet will follow the contour of the surface into a dry lead spinout chamber where it is trapped.

4 Angled Backstop (or 45° Inclined Plates). Uses a sand or water trap and has been the traditional alternative for indoor ranges.

- a The angle of the plate should never exceed 45° from the ground. The 45° plate and pit backstop is relatively inexpensive, but there are several disadvantages. Sand traps require frequent cleaning to remove bullet fragments. Cleaning operations require workers to wear high-efficiency particulate air (HEPA) filter masks if material is removed dry. It is best to dampen the sand trap material before and during cleaning operations to eliminate dust. To maintain a healthier internal environment, frequent removal, disposal, and replacement of lead-laden sand is required. The surface should be continually raked to keep the sand level and to guard against splatter as lead buildup occurs.

- b The cleaning operations are easier when a water trap is used. However, a water trap requires chlorine and other chemicals to retard algae growth and antifreeze in colder months to prevent freezing.

Installing a water pit requires a different approach to foundations and footings, especially in areas affected by earthquakes or freezing.

- (2) General Range Cleaning. Both dry and wet methods can be used to clean the range. The method selected depends on the frequency of use. The wet method is preferred when floor drains are available, and keeping materials wet during cleaning operations reduces or eliminates release of microscopic dust particles. When dry methods must be used, workers must use the appropriate personal protective equipment (PPE) that has been established by local industrial hygiene personnel. After cleaning operations are complete, workers must shower and have work clothing laundered.
- (3) Backstop Steel Plate Specifications.
 - (a) Steel plates supported by concrete or masonry should be anchored by expansion bolts or toggle bolts, as suitable for construction, with flush countersunk heads not more than 12 inches on center of all edges of each plate. Joints and edge lines should be backed with continuous $\frac{1}{2}$ -inch thick plate no less than 4 inches wide. Bolts should pierce both the facing and back plates. Expansion bolts should penetrate concrete not less than 2 inches. Steel plates must have milled edges at all joints.
 - (b) Joints must be butted flush and smooth. After the plates are erected, they must not have any buckles or waves. Exposed edges must be beveled at 42° to a fillet approximately $\frac{1}{2}$ -inch thick. There must be no horizontal joints in any steel plate work.
 - (c) Welding must meet the American Welding Society code for welding in building construction. Steel plates joined at, and supported on, structural steel supports must be spot-welded to steel supports not more than 6 inches on center.
- (4) Baffles, Deflectors, and Shields. Baffles on indoor ranges protect lighting fixtures, HVAC ducts, ceilings, and target carrier apparatus. Baffles are designed to protect against the occasional errant bullet but not for repeated bullet strikes.
 - (a) To cover or protect vulnerable ceiling areas or range fixtures, baffles must extend the entire width of the range and downward. Spacing of baffles on a 50 to 75 feet range depends on the ceiling design. Range distance (firing line to target line) and height are factors. Ceilings must be impenetrable.

- (b) Baffles or deflector plates must be used when modifying an existing building, especially in a building constructed of wood. This will prevent bullets from escaping or penetrating. Baffles should be a minimum of 10-gauge steel covered with a minimum of 1 inch of soft wood to prevent back splatter. The wood traps the projectile, whereas bare steel redirects it downward into the range area. A wood surface must be applied to overhead baffles, because ranges with untreated baffles usually show significant damage to concrete floors and often complete penetration through wood floors.
- (c) Baffles should be installed at a 25° angle as measured from the horizontal plane of the ceiling. The baffle size and placement depends on what surface areas require protection. For example, ceiling baffles are wider than side baffles.
- (d) Unlike baffles, deflectors are installed vertically and horizontally to redirect wide-angle shots into the backstop area. Deflector shields protect pilasters, leading edges of sand traps, bottom edges of backstops, doorways, windows, ventilation registers along the wall, etc. Deflectors are not covered with wood generally, but may be. These devices are also installed at a 25° angle either to the wall surface or floor.
- (e) To protect ceiling areas, special impenetrable shields are installed above the firing line, especially in wood frame buildings.
 - 1 Shields should extend the entire width of the range and 12 feet forward of the firing line. Floor shields may be required on wood floors.
 - 2 Shields must be constructed from metal sheets according to planned use. For example, 10-gauge steel covered with a minimum of 1 inch of soft wood is effective in stopping most pistol calibers.
- (5) Floors, Walls, and Ceilings. Indoor range facility floors, walls, and ceilings must be impenetrable; therefore, an existing building must have a structural analysis to determine loading factors that may exceed original design specifications. Wooden buildings may require modifications to support the increased weight. Specifications for new construction call for either poured-in-place concrete, pre-cast concrete, or dense masonry block. Solid cinder block should be used in place of hollow-core block. Specifications for modifying existing buildings call for adding additional materials to prevent bullet escape, which can be done with wood and steel laminated shields. Laminated shields can be constructed onsite by placing sheet-steel or steel plates between two sheets of ¾-inch plywood. While

this method is more expensive than the extended booth design, it allows for an open firing line and better visibility for the range officer. Walls should be treated beginning 3 feet to the rear of, and extending forward of, the firing line until all vulnerable surfaces are protected. Acoustical material should be applied to the surfaces to aid in sound control.

- (a) Floors. The range floor should be constructed by using a single pour and a fine, uniform-aggregate mix of concrete. Reinforcement should be No. 4 steel rods placed 12 inches on center along with 6- by 6-inch 8/8-gauge welded wire fabric. This may vary according to soil conditions. Very large floor areas may require two or more pours with expansion joints between each slab.
 - 1 The floor should be designed to slope down toward the target line, beginning at the firing line, ¼-inch per foot.
 - 2 The floor should be no less than 4 inches thick.
 - 3 Floor size is governed by design. Larger size will result in higher costs for ventilation, lighting, heating, and overall building design. The decisions should be based on expected number of users versus overall cost.
- (b) Floor Guards. Floor guards are provided to protect leading edges or protrusions; e.g., drains, traps or other protrusions from the floor area. Floor guards are designed to redirect errant bullets into the backstop area, which minimizes range damage.
 - 1 Floor guards are constructed from 10-gauge steel and may be covered with wood.
 - 2 Floor guards are installed horizontally along the floor surface parallel to the firing line.
 - 3 Floor guards typically slope away from the firing line at a 25° angle to the horizontal.
 - 4 Floor guards should extend only as high as necessary to protect exposed surfaces.
- (c) Floor Drains. Floor drains should be constructed of cast iron soil pipe. The drain pipe should be attached to a lateral drain located 1 foot forward of the backstop floor guard. The drain pipe must lead to a filtration system approved by the cognizant environmental, safety, and health organization on the site.

- (d) Walls. Poured concrete or masonry is preferred for wall construction, but wood may be used. Wall thickness must conform to acceptable engineering standards and comply with Federal, State, county and local zoning codes. Usually, no less than 3-inch thick, reinforced walls should be constructed to prevent the exit of any projectiles.

NOTE: This specification usually requires the use of steel or similar material where wooden walls are used. The size depends on building design, geological conditions, and climate. Size includes the height, thickness, and length of the running wall.

- (e) Ceiling. Ceiling material should reduce sound, protect lighting devices, reflect light and be impenetrable. Typically, ceilings include 10-gauge steel baffles, 2- by 4-foot white acoustic panels, and clear-light panels.

- 1 The ceiling should be a minimum of 8 feet above the floor level and have an acoustically treated, smooth surface to allow for positive air movement downrange.

- 2 Baffles to protect adjoining areas should be above a false ceiling or designed into the roof/ceiling structure.

- (6) Shooting Booths. Commercial or locally built shooting booths may be desirable on pistol ranges; however, they are not recommended for rifle ranges. Shooting booth panels can provide an impenetrable barrier between shooters, reduce sound levels, restrict the travel of brass, and act as a spray shield when revolvers are used.

- (a) Shooting booths should be omitted for ranges that use only rifles.
 - (b) A shooting booth should never extend more than 18 inches behind the firing line because greater extension may obstruct the range control officer's visibility.
 - (c) Bullets fired from any firearm used on the range must not be able to penetrate booth panels. The booth panel must be able to withstand the impact of a bullet fired at any angle to the surface and at point-blank range.
 - (d) Design criteria for the construction of booth panels are as follows:
 - 1 Cover the 10-gauge steel plate with a nominal 2 inches of soft wood. In a series of tests using 10-gauge steel plate, firing all lead bullets at right angles, the plate covered with a nominal 2 inches of soft wood withstood direct hits from

- all standard pistol calibers up to, and including, .44 caliber magnum;
- 2 Use special acoustical materials to ensure that panels reduce muzzle blast effects on all shooters and range personnel;
 - 3 Ensure that panels do not restrict airflow;
 - 4 Ensure that panels do not restrict the range officer's visibility of the firing line; and
 - 5 Construct panels so they extend from the floor to a minimum height of 6 feet. Panels should be ceiling height.
- (7) Target Carriers and Turning Mechanisms. An indoor range can be operated more efficiently and safely by installing a target transport system. This system may be a simple, hand-made device or a completely automatic, electrically powered system. Either one will enhance safety by eliminating the need to walk downrange to replace targets. Target carrier systems speed up range operations. A turning target mechanism is available that faces the target parallel to the line of sight and then turns the target 90° to the line of sight to begin the stated time period. The target carriers should position the targets in the approximate center of the backstop.
- (8) Control Booth. Range control booths must allow for maximum visibility and provide for easy access into and out of the range and ready area. The control booth should provide seclusion from and immediate access to the range environment. This design protects the range officer from frequent exposure to high sound levels and lead emissions.
- (9) Communications. A communications system capable of relaying range commands distinct and separate from the sounds generated by shooting activities is required. Communications systems must account for shooters who wear two pairs of hearing protectors and persons who have substantial hearing loss.
- (10) Ventilation and Filtering Systems. This section deals with the design or redesign of ventilation systems for indoor firing ranges. Administrative or engineering controls must be instituted to prevent shooters from being exposed to airborne lead levels exceeding acceptable limits. Administrative controls are used either when engineering controls fail to reduce exposure or when range use exceeds HVAC system specifications. Administrative controls are especially applicable to reducing risks on existing ranges.

- (a) Administrative controls used to reduce exposure levels on an indoor range must be rigidly followed and enforced, and compliance must be recorded in a log book for purposes of analysis and reference.
 - (b) The following administrative controls are provided and must be used where individuals are frequently exposed to airborne lead.
 - 1 Provide range maintenance personnel with appropriate PPE; e.g., safety glasses and respirators.
 - 2 Provide proper HEPA filter cleaning equipment. The equipment must be able to remove accumulated lead dust from floors, walls, and ledges and must include attachments capable of removing lead-laden sand from the backstop area.
 - (c) A ventilation system must be installed that will provide clean air in the user's breathing zone to reduce exposure to potentially dangerous materials to safe levels.
 - (d) Adopt administrative controls that monitor and control exposure time for a given user and/or assigned range personnel.
- (11) Lighting.
- (a) A visually safe facility should be free of excessive glare and major differences in light levels. Therefore, floors and ceilings should be designed to provide light reflection. In the event of a power outage, battery-powered emergency lighting must be provided for emergency exits.
 - (b) Rheostat-controlled lighting fixtures, which can reproduce near-daylight and low-light conditions, are best suited for indoor ranges. Range lighting involves three systems: general lighting, local lighting, and semi-direct lighting.
 - 1 General lighting provides uniform light levels over the entire range area and adjoining areas and is usually installed in a symmetrical arrangement to blend with the architecture.
 - 2 Local lighting supplements general lighting along the firing line to provide better visibility for those tasks associated with the loading and firing of firearms.
 - 3 Semi-direct lighting distribution directs 60 to 90 percent of the lighting on the target with a small upward component to

reflect from the ceiling and walls to soften shadows and generally improve range brightness. When ceilings are white, lighting fixtures mounted too close together create excessive glare.

- (c) Lamp specifications for general lighting must be adjustable to provide 0.2 to 50 foot-candles of luminance measured at a point 7 yards from the target line. Local lighting should produce 0.2 to 60 foot-candles of luminance on the firing line. Semi-direct lighting on the targets should achieve 0.2 to 100 foot-candles of luminance. Glare should be reduced or eliminated by incorporating pastel colors in the interior design.
 - (d) Lighting designs should also seek to balance the color of light emissions. For example, most fluorescent fixtures produce high levels of blue, which alone are not suitable for indoor ranges. If fluorescent fixtures are used, green tubes or other light sources should be installed to balance the colors.
- (12) Plumbing. Plumbing requirements specify that there must be a fresh water supply for personal hygiene and for range cleaning chores. There also must be a waste removal system for normal waste material and material removed from the range. An approved filtration system must be provided for range cleaning waste. Floor drains should be connected to this alternate waste system. Restrooms, showers, and sinks should be connected to a regular sewer system.
- (13) Sound Control. Sound control on indoor ranges includes two distinct components: airborne and structure-borne sound. For airborne sound, all leaks into outer areas should be sealed, which includes airtight insulation around doors, windows, HVAC ducts, walls, and ceilings. Structure-borne sound reduction is necessary to protect adjoining, occupied rooms. Acoustical material should be applied to walls, HVAC ducts, floor, and ceiling areas.
- (14) Range Control. Range control provides rules and supervision that encourage safe and proper use of a range. Safety devices control the physical use of an indoor range and may include warning lights, alarm bells, switch locations, etc. For example, an indoor range with a door in the downrange area should be equipped with an alarm. The door could also be secured by a mortise lock or barred from within but must remain a fire exit. Fire codes generally prohibit bars on doors that would delay escape from a building. Emergency personnel must be able to access the doors. Any door that can be accessed from the outside must be marked with warning devices to indicate when the range is in use. When installing doors on indoor ranges, refer to Life Safety Code National Fire Protection Association (NFPA) 101.

- (15) Target Carriers. Target carriers are used for the convenience of shooters to allow them to continue shooting without delay when target changes are necessary. For health considerations, target carriers keep shooters out of the high lead concentration areas and safely behind the firing line.
- (16) Heaters. Protected heating units should be installed behind and above the firing position to provide a comfort zone for shooters.
- (17) Gun Racks. Gun racks should be mounted behind the firing positions as an additional safety feature to reduce gun handling and to keep the range areas orderly. Appropriate material should be used to construct the gun racks, and the design must correspond to the weapons being used.

6. LIVE FIRE SHOOT HOUSE.

a. Introduction.

- (1) A live fire shoot house (LFSH) is intended for use in advanced tactical training for Security Police Officers. Use of this facility includes individual tactics or Special Response Team force option training. All LFSHs must have an elevated observation control platform (EOCP). The following sections illustrate recognized construction methods for LFSHs. However, they do not eliminate the requirement for sound professional engineering design and validation.
- (2) Administrative controls not directly related to design and construction must be in place during facility use. The administrative controls and engineering design allow for a reduction in physical barriers that prevent rounds from escaping the facility. Designed barriers must prevent a round fired with a vertical upward error of 15° from escaping the facility.

b. Site Selection.

- (1) Site selection for an LFSH is similar to that for any range facility. Terrain features, noise, and availability of utilities and access roads must be considered, as already discussed in previous sections for indoor and outdoor ranges. The LFSH should be placed adjacent to other range facilities whenever possible so that it may utilize the same support facilities, access roads, etc.
- (2) Facility design, target and shooter placement, and other administrative controls minimize the possibility of rounds being fired over the top of the walls and leaving the structure and mitigate the need for an SDZ outside the confines of the LFSH proper.

ATTACHMENT 14



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INDOOR FIRING RANGES



Spotlights

Follow us @NIOSH_FirRanges on Twitter (https://twitter.com/#!/NIOSH_FirRanges) & (<http://www.cdc.gov/Other/disclaimer.html>)

OSHA cites Illinois Gun Works \$111,000 for exposing workers to noise and lead (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=22524) & (<http://www.cdc.gov/Other/disclaimer.html>)

OSHA cites South Carolina lead removal company \$480,000 for failing to protect employees from lead exposure at a firing range (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=21627) & (<http://www.cdc.gov/Other/disclaimer.html>)

Kentucky Labor Cabinet issues 11 workplace violations and fines of \$372,000 to a Louisville firing range & (http://www.labor.ky.gov/labornews/Press_Releases/LostLodge111910.pdf) & (<http://www.cdc.gov/Other/disclaimer.html>)

OSHA cites Florida firing range company more than \$2 million for exposing workers to lead and other hazards (https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=18219) & (<http://www.cdc.gov/Other/disclaimer.html>)

Indoor firing ranges are popular among law enforcement and recreational shooters because they offer protection from inclement weather conditions and can be operated around the clock under controlled environmental conditions. However, many firing range facilities lack environmental and occupational controls to protect the health of shooters and range personnel from effects of airborne lead, noise, and other potential exposures.

This page provides links to information about the evaluation, measurement, and control of noise and airborne lead exposures at indoor firing ranges.

NIOSH research shows that washing hands with soap and water is not completely effective in removing lead (and other toxic metals) from the surface of the skin. NIOSH researchers developed and patented a novel and highly

effective skin decontamination/cleansing technology. NIOSH recommends use of this technology to reduce the risks of lead exposures after firing weapons. The technology has been licensed to two companies: MEDTOX Scientific (under the brand name LeadTech Wipes™) and the Hygenall Corporation (under the brand name Hygenall™) for commercial production and distribution. Mention of specific corporate or product names does not constitute a commercial endorsement by NIOSH.

NIOSH Publications

Preventing Occupational Exposures to Lead and Noise at Indoor Firing Ranges
([/niosh/docs/2009-136/default.html](http://niosh/docs/2009-136/default.html))

DHHS (NIOSH) Publication No. 2009-136

This Alert presents five case reports that document lead and noise exposures of law enforcement officers and students. The Alert examines firing range operations, exposure assessment and control methods, existing regulations, and exposure standards and guidelines.

Reducing Exposure to Lead and Noise at Indoor Firing Ranges ([/niosh/docs/wp-solutions/2010-113/](http://niosh/docs/wp-solutions/2010-113/))

NIOSH Publication No. 2010-113

This two-page Workplace Solutions document provides clear and simple recommendations to workers, occupational shooters, and operators of indoor firing ranges to reduce their occupational exposure to airborne lead and high-intensity noise.

Reducing Exposure to Lead and Noise at Outdoor Firing Ranges ([/niosh/docs/wp-solutions/2013-104/](http://niosh/docs/wp-solutions/2013-104/))

NIOSH Publication No. 2013-104

This two-page Workplace Solutions document provides clear and simple recommendations to workers, occupational shooters, and operators of outdoor firing ranges to reduce their occupational exposure to airborne lead and high-intensity noise.

Lead exposure and design considerations for indoor firing ranges ([/niosh/docs/76-130/](http://niosh/docs/76-130/))

DHHS (NIOSH) Publication No. 76-130 (December 1975)

This technical document provides the user with recommendations for design considerations and work practices to reduce or eliminate health hazards associated with indoor firing ranges. It includes topics such as ventilation, noise, and maintenance issues.

Peer-Reviewed Publications

Measurement of impulse peak insertion loss for four hearing protection devices in field conditions (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20040191&View=f>)

Int J Audiol 2012 Feb; 51(S1):S31-S42

Handwipe method for removing lead from skin (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20038921&View=f>)

J ASTM Int 2011 May; 8(5):JAI103527

Evaluation of a handwipe disclosing method for lead (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20038656&View=f>)

J ASTM Int 2011 Apr; 8(4):1-7

Measurement of impulse peak insertion loss for five hearing protectors

(<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20038953&View=f>)

J Acoust Soc Am 2011 Apr; 129(4)(Part 2):2651

Noise control solutions for indoor firing ranges (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20037714&View=f>)

Noise Control Eng J 2010 Jul; 58(4):345-356

Assessment of noise exposure for indoor and outdoor firing ranges

(<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20032531&View=f>)

J Occup Environ Hyg 2007 Sep; 4(9):688-697

Firearms and hearing protection (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20031787&View=f>)

Hearing Rev 2007 Mar; 14(3):36, 38

Morbidity and Mortality Weekly Report June 17, 2005 / 54(23):577-579: Lead Exposure from Indoor Firing Ranges Among Students on Shooting Teams --- Alaska, 2002--2004

(<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5423a1.htm>)

During 2002--2004, the Alaska Environmental Public Health Program (EHPH) conducted lead-exposure assessments of school-based indoor shooting teams in the state. This investigation revealed that lead exposure can occur at indoor firing ranges despite federal regulations and specific guidelines pertaining to range design and operation.

NIOSH/NHCA best-practices workshop on impulsive noise (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20027573&View=f>)

Noise Control Eng J 2005 Mar-Apr; 53(2):53-60

Noise exposure assessment and abatement strategies at an indoor firing range

(<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20023321&View=f>)

Appl Occup Env Hyg 2003 Aug; 18(8):629-636

Indoor Shooting Ranges (http://bookstore.ashrae.biz/journal/journal_s_article.php?articleID=463)

☞ (<http://www.cdc.gov/Other/disclaimer.html>)

ASHARE Journal 2002 Dec; 44-48

Ventilation control of lead in indoor firing ranges: inlet configuration and booth and fluctuating flow contributions (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=00199081&View=f>)

s1=00199081&View=f)

Am Ind Hyg Assoc J 1991 Feb; 52(2):81-91

Morbidity and Mortality Weekly Report September 23, 1983 / 32(37):483-4,489: Reducing Exposures to Airborne Lead in Indoor Firing Ranges -- United States

(<http://www.cdc.gov/mmwr/preview/mmwrhtml/00000142.htm>)

Between 1980 and 1982, NIOSH completed nine evaluations of exposures to lead in indoor firing ranges. Results show that exposure of shooters to airborne lead is greatly reduced by replacing traditional lead bullets with nylon-clad, copper-jacketed, or zinc ammunition.

For more publications, see:

NIOSH/NHCA search results on Firing Ranges ([http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?](http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=firing%2BAND%2Brange&f1=*&Adv=o&terms=1&View=b&Startyear=&B1=Search&Limit=500&Sort=DP%2BDESC&D1=10&EndYear=))

s1=firing%2BAND%

2Brange&f1=*&Adv=o&terms=1&View=b&Startyear=&B1=Search&Limit=500&Sort=DP%

2BDESC&D1=10&EndYear=)


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NIOSH Health Hazard Evaluations


NIOSH conducts Health Hazard Evaluations (HHEs) to find out whether there are health hazards to employees caused by exposures or conditions in the workplace.


Some recent HHE reports related to firing ranges have been listed below. For a comprehensive listing of HHE reports please search the [HHE Database \(/niosh/hhe/\)](#).


[Health hazard evaluation report: HETA-2011-0069-3140, noise and lead exposures at an outdoor firing range – California](#)  ([/niosh/hhe/reports/pdfs/2011-0069-3140.pdf](#))


[Health hazard evaluation report: HETA-2008-0275-3146, evaluation of lead exposure at an indoor firing range – California](#)  ([/niosh/hhe/reports/pdfs/2008-0275-3146.pdf](#))


[Health hazard evaluation report: HETA-2005-0153-2997, Markham Park, Broward County Parks and Recreation Division, Sunrise, Florida](#)  ([/niosh/hhe/reports/pdfs/2005-0153-2997.pdf](#)) [PDF - 930 KB]


[Health hazard evaluation report: HETA-2002-0131-2898, Fort Collins Police Services, Fort Collins, Colorado](#)  ([/niosh/hhe/reports/pdfs/2002-0131-2898.pdf](#)) [PDF - 636 KB]


[Health hazard evaluation report: HETA-2000-0191-2960, Immigration and Naturalization Service, National Firearms Unit, Altoona, Pennsylvania](#)  ([/niosh/hhe/reports/pdfs/2000-0191-2960.pdf](#)) [PDF - 1,393 KB]

[Health hazard evaluation report: HETA-1997-0255-2735, Forest Park Police Department, Forest Park, Ohio](#)  ([/niosh/hhe/reports/pdfs/1997-0255-2735.pdf](#)) [PDF - 254 KB]

[Health hazard evaluation report: HETA-1996-0218-2623, New Hampshire Police Standards and Training Council, Concord, New Hampshire](#)  ([/niosh/hhe/reports/pdfs/1996-0218-2623.pdf](#)) [PDF - 231 KB]

[Health hazard evaluation report: HETA-1996-0107-2613, Dartmouth Police Department, Dartmouth, Massachusetts](#)  ([/niosh/hhe/reports/pdfs/1996-0107-2613.pdf](#)) [PDF - 215 KB]


[Health hazard evaluation report: HETA-1992-0034-2356, Saint Bernard Police Department, Saint Bernard, Ohio](#)  ([/niosh/hhe/reports/pdfs/1992-0034-2356.pdf](#)) [PDF - 215 KB]


[Health hazard evaluation report: HETA-1991-0346-2572, FBI Academy, Quantico, Virginia](#)  ([/niosh/hhe/reports/pdfs/1991-0346-2572.pdf](#)) [PDF - 325 KB]

Other Resources

[Range Design Criteria](#)


[U.S. Department of Energy](#)


[Office of Health, Safety and Security](#) 

(http://www.hss.doe.gov/SecPolicy/pfs/Range_Design_Criteria.pdf) 


(<http://www.cdc.gov/Other/disclaimer.html>)

[Workshop on Indoor Shooting Ranges: Responsible Care of Range Environment](#)

[Proceedings of the Workshop on Indoor Shooting Ranges](#) 


(http://www.wfsa.net/pdf/WFSA_2005.pdf)  (<http://www.cdc.gov/Other/disclaimer.html>)

Lead Management and OSHA Compliance for Indoor Shooting Ranges

(<http://ia601204.us.archive.org/32/items/LeadOsha/Lead-OSHA.pdf>) 

(<http://www.cdc.gov/Other/disclaimer.html>)

The National Association of Shooting Ranges (NASR) produced this manual through an alliance with the U.S. Department of Labor's Occupational Safety and Health Administration, and input from the National Institute for Occupational Safety and Health of the Centers for Disease Control and Prevention. The manual provides valuable background on lead issues, as well as general guidance for lead monitoring and ventilation, precautions and coverage for employees, and related business practices.

OSHA-NASR-SAAMI Alliance (http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=1330)  (<http://www.cdc.gov/Other/disclaimer.html>)

August 5, 2002: The Occupational Safety and Health Administration, the National Association of Shooting Ranges (NASR) and the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI) established an Alliance to promote safe and healthful working conditions for workers in target shooting facilities.

Contact Us

- **NIOSH Toll-Free Information Inquiry Service**
1-800-CDC-INFO (1-800-232-4636)
Outside the U.S. 513-533-8328
Email: [NIOSH Firing Range \(mailto:NIOSHfiringRanges@cdc.gov\)](mailto:NIOSHfiringRanges@cdc.gov)
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In English, en Espanol
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- **Email NIOSH (<http://www.cdc.gov/niosh/email-eidtech.html>) with your questions or concerns on exposures to lead and noise at indoor firing ranges**
(<http://www.cdc.gov/niosh/email-eidtech.html>) This is an occupational safety and health information service
and not a hotline for medical emergencies.

Page last reviewed: October 18, 2011

Page last updated: November 27, 2012

Content source: [National Institute for Occupational Safety and Health](#) Division of Applied Research and Technology

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348 - [Contact CDC-INFO](#)

ATTACHMENT 15

Olive Garden becomes closer to reality; shooting range approved too

Posted: January 17, 2012 - 11:19pm

Baxter/Brainerd Minnesota

The council also approved a CUP amending the existing plat of Kohls PUD to allow the Mills Shooting Range, that would be located at the site of the former Paul Bunyan Bowl.

Deblon said the council already approved the PUD, but this motion allows for an indoor shooting range and archery center. Deblon said the council agreed that the shooting range would be constructed so noise, air pollution and nay hazardous waste would be properly mitigated.


Klein asked about the noise from the gunshots. Deblon said the noise would be mitigated. Deblon said the gunshots would be hard to hear, but several factors plan into the noise, such as temperatures and wind.

"This will be a state-of-the-arts facility," said Deblon. "Maximum safety has been considered."


Cross said that the facility would be air tight and if someone did not follow proper protocol that a noise, sounding like a car door shutting, could be heard.

Council member Todd Holman was concerned that the planning commission recommended that no over story tree, or shade tree, be planted in the parking lot island closest to the building, as there were shrubs already planted. Holman said that it was against the city ordinance. The council agreed and voted to have one over story tree be planted in the parking lot island.

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2012-09-11 / Front Page

Board grants variance for indoor shooting range

Applicant to return for site plan approval

BY JAMES McEVOY

Staff Writer

MONROE — The township Zoning Board of Adjustment has granted a use variance for an indoor shooting range on Mott Avenue, near the township's border with Jamesburg.

The unanimous approval came after a heated discussion among board members, the applicant and residents in attendance at a recent meeting.

Board Chairwoman Carol Damiani said she ultimately supported the variance because she preferred an indoor facility as opposed to the outdoor target practice that has previously taken place on the vacant property.

Discussion became contentious when Damiani accused George Tarantino, owner and applicant, of firing automatic firearms on the vacant property.

"I experienced that at the [neighboring St. James] Cemetery on Palm Sunday," Damiani said. "It was automatics being shot



because I heard them. I felt like I was in Afghanistan.”

Though Tarantino acknowledged he has shot at targets on his property, he said he has not fired any automatics. He also said police were notified in advance of the target practice.

Tarantino sought the use variance after being granted a change of use in 1999 to construct an automobile repair facility on the

same site, according to Otto Kostbar, the attorney representing the applicant.

Tarantino testified he did not develop that use due to financial concerns.

“At the time, the auto body business was a really good business. It’s not a great business anymore,” he said. “Everybody’s taking their money and running.”

Tarantino also owns the Tarantino Bros. Auto Body shop located on Helmetta Road.

Kostbar said the 12.5-acre parcel on Mott Avenue is currently heavily wooded and vacant.

The property is situated between St. James Cemetery and the building that houses the New Jersey Construction Craft Laborers Apprenticeship Program, with the salvage yard of Red and Black Auto Inc. to the rear, Tarantino said, noting there are no residences adjacent to his property.

He said he thought the indoor shooting facility would be a positive recreational use for the township.

“A lot of people in Monroe have no place to shoot,” he said, noting he currently travels to an indoor shooting facility in Jackson.

In response to numerous questions from board members and professionals, Tarantino testified regarding membership, caliber and age requirements for the facility, which he said will include 14 or 15 ranges or stations that are proposed to be 80 feet in length.

He testified patrons would be required to have a state firearms purchaser identification card and said most indoor ranges prohibit any firearm that is .45-caliber or above.

Tarantino said use of the facility will be available to Monroe Township police officers; proposed business hours would be 8 a.m. to 10 p.m., seven days a week.

Tarantino also testified that he would eventually seek a retail component for the facility should he be issued a federal license to rent and sell firearms.

John Chadwick, the applicant's planner, acknowledged that the proposed use is atypical and not specifically addressed by township regulations.

Despite the unusual nature of the proposed use, Chadwick testified that the location is appropriate for the facility.

"It is located in an area that is ideally suited for it," he said, noting the lack of neighboring residences. "There's isn't a whole lot around."

Debate carried over into the public comment section.

Robert Grundy, who supports the facility and said he lives close to the proposed site, identified himself as a gun enthusiast and suggested that some board members might be uneducated about firearms.

"A semi-automatic to the untrained person can sound like an automatic," Grundy said. "For [Damiani] to say that you felt like you were in Afghanistan seemed prejudiced to Tarantino."

He began discussing some of the testimony, prompting Board Attorney Patrick Bradshaw to ask Grundy to keep his comments limited to whether he was in support of the use variance.

Resident Darren Kutz said he also supported the facility.

"I'm in favor of it. I think it's something we could use in this town," Kutz said. "We don't have enough places in the area."

He said such a facility could help people unfamiliar with guns develop respect and better understanding on how to operate a firearm.






"There's nothing more dangerous than a gun in an untrained hand," he said.

Not all residents supported the facility, however.

"I am definitely against it," said resident Esther Gregory, citing noise and safety concerns.

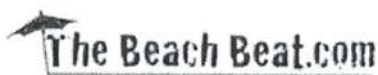
The applicant will have to return for preliminary and final site plan approval; no hearing dates have been set to date.

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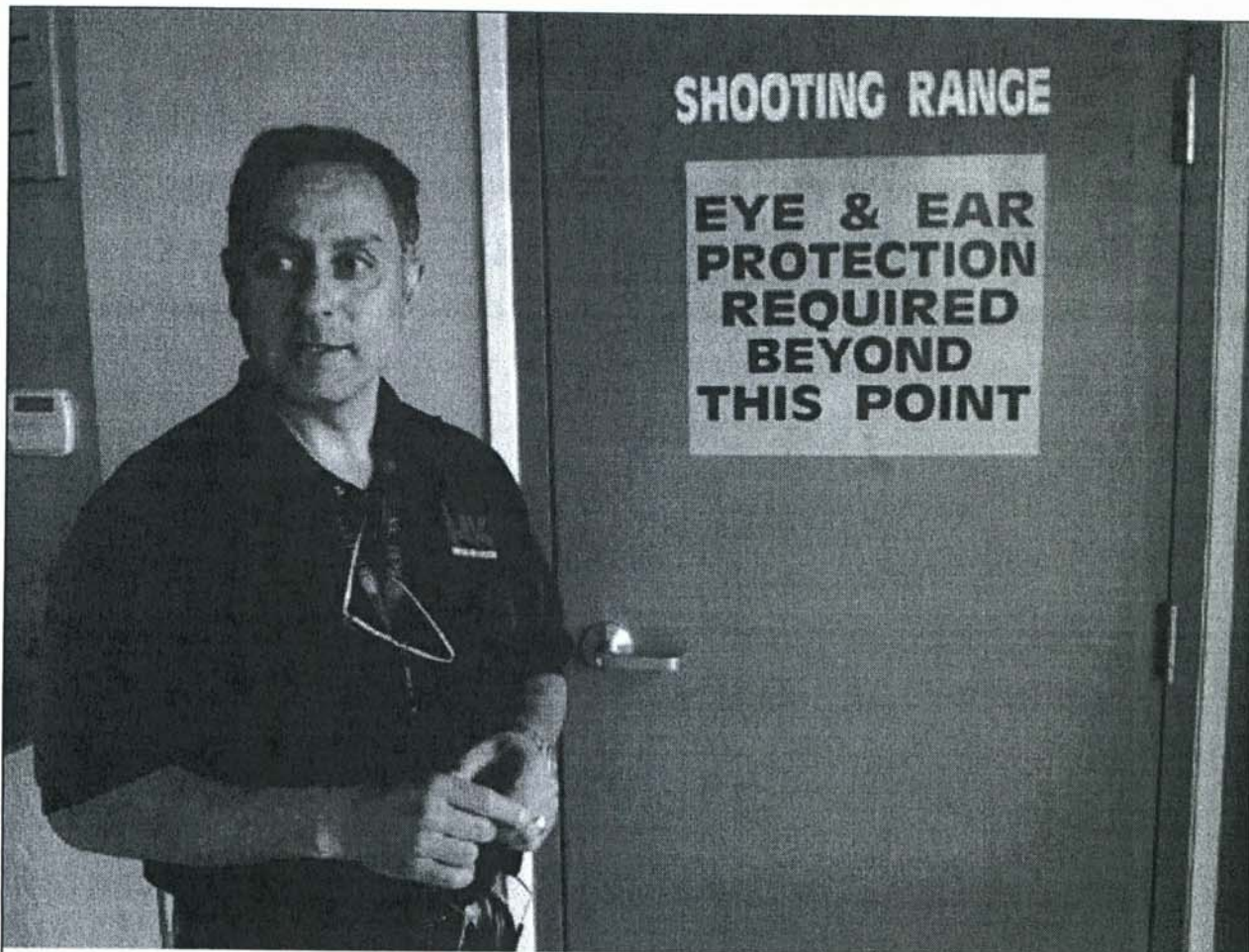
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Do you believe Congress and the President will reach an agreement this month that will prevent the nation from going over the "fiscal cliff" on Jan. 1?

Federal Way's first indoor shooting range opens for business



ANDY HOBBS/FEDERAL WAY MIRROR

With this shooting range, owner Moe Baghai wanted a clean and health-conscious facility.

By ANDY HOBBS

Federal Way Mirror Editor

SEPTEMBER 26, 2012 · UPDATED 11:30 AM

Federal Way's first indoor shooting range has generated a buzz among gun enthusiasts and law enforcement.

Federal Way Discount Guns opened the long-awaited range on Monday on South 324th Street. The indoor range features top-notch ventilation and soundproofing, with more than a dozen lanes for target practice.

Federal Way gun owners who travel to shooting ranges in Puyallup, Tacoma and Ravensdale now have one in their own backyard.

For members of the Armed Defense Training Association, the shooting range marks a milestone. The non-profit ADTA promotes responsible firearms events and education at the region's ranges.

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Mark Knapp, a local attorney who writes a column about firearms for The Mirror, helped inspire the ADTA's formation with a December 2010 column titled "Federal Way needs a shooting arts center."

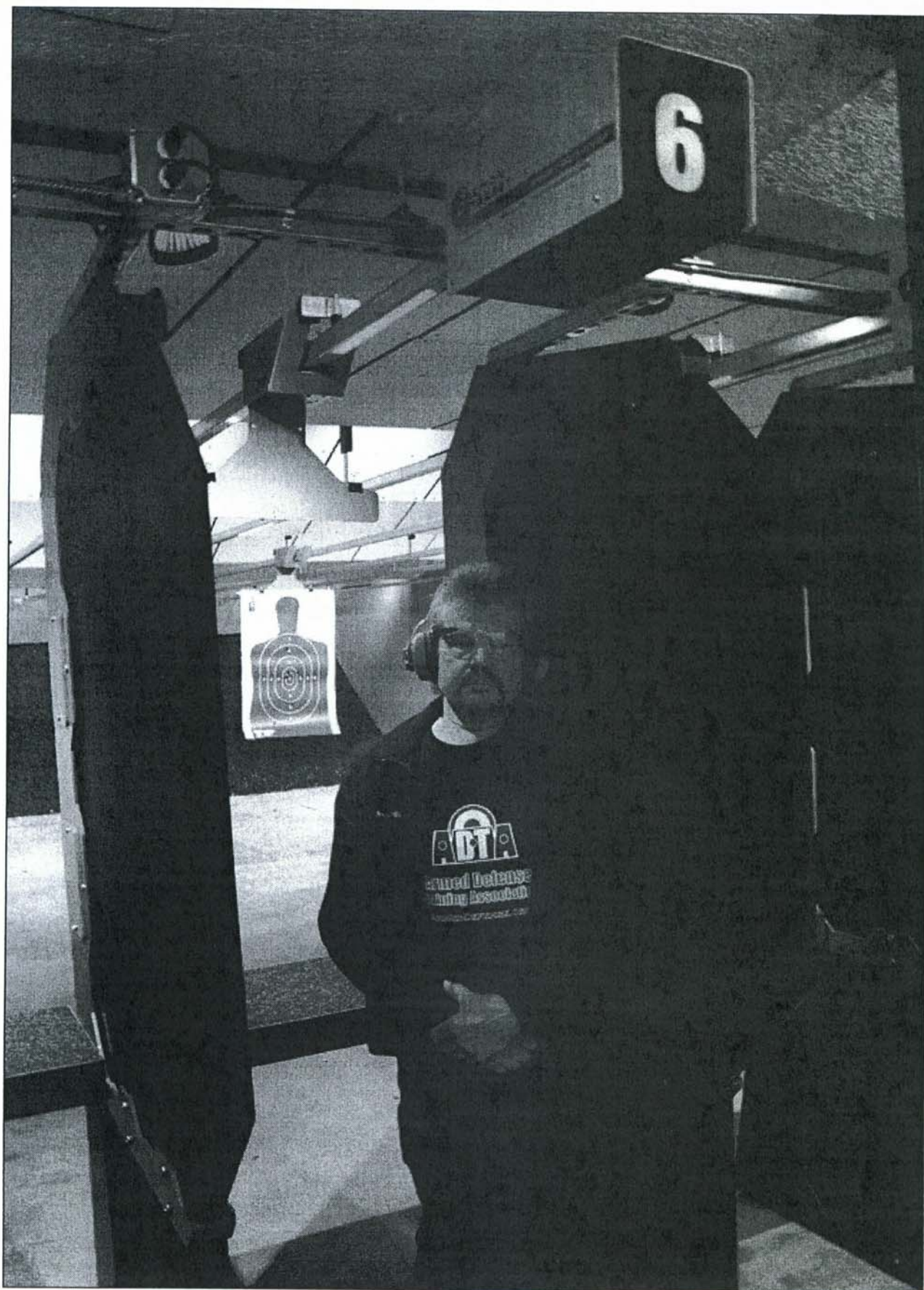
In the column, Knapp explored the potential cultural and economic impact of a local shooting range.

"We want to see this place be a huge success," Knapp said. "With a facility like this, there's no limit."

Knapp joined ADTA members Ed Streit and Dan Goede at the new shooting range on Monday in Federal Way. They complimented the facility as a clean and appropriate place to practice, even for families.

"Anyone can buy a gun," Goede said. "They have an obligation to learn how to shoot those guns safely and responsibly."

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(Pictured: Federal Way resident Dan Goede inside the new shooting range at Federal Way Discount Guns.)

The range

The range requires membership and background checks for every customer, all in the name of safety.

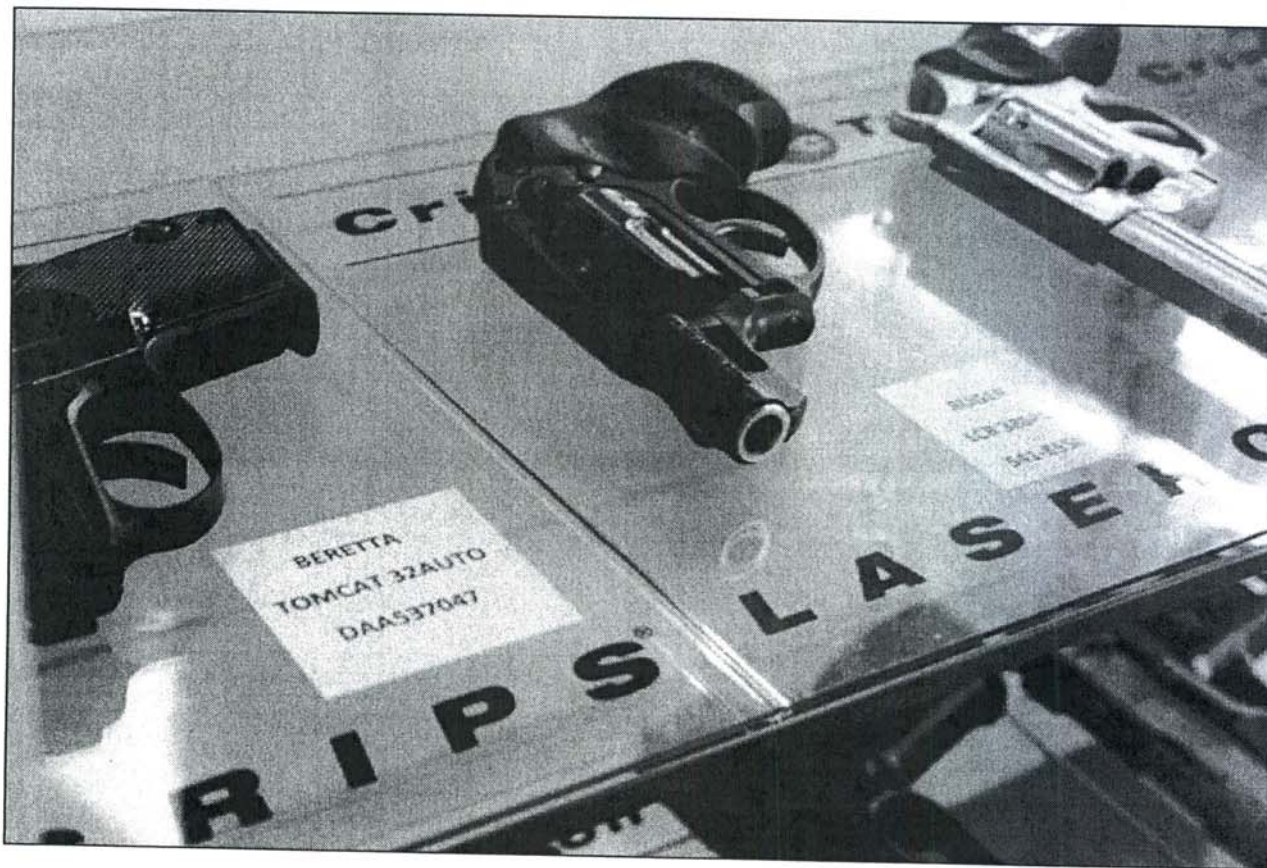
Business owner Moe Baghai also wanted a clean and health-conscious facility.

The gunfire is barely audible outside the building, where a massive ventilation system takes up an entire outside wall. Inside the range, the system constantly cleans the air, removing up to 700 pounds of airborne lead every nine months.

For 22 years, Baghai has operated his gun shop in Federal Way, formerly at a location on Pacific Highway South. The shooting range adds another dimension to both his business and the local culture.

"It gives people a place to come to, a place to gather and share their hobbies," Baghai said, adding that the time seemed right to open the range.

In the coming months, the range will expand to include more shooting lanes. A covered front patio will feature refreshments and seating for customers to take breaks.



(Pictured: Guns for rent behind a glass case at Federal Way Discount Guns and Shooting Range)

Law enforcement

The shooting range also solves a problem for Federal Way police.

Officers no longer need to leave Federal Way to practice their marksmanship. Through an arrangement with the shooting range, Federal Way police can sharpen their proficiency while on duty.

When a Federal Way officer uses deadly force, weapon proficiency means fewer bullets are fired — and that means a safer community, said Federal Way Police Cmdr. Kyle Sumpter.

"Nobody's a master at anything unless they train a lot and regularly," said Sumpter, a recent contestant on The History Channel show "Top Shot."

Several police departments in the area have their own private shooting ranges. The Federal Way Police Department, which lacks the finances to build and maintain a local range, was sending officers to train in Puyallup.

"This availability to use a range, financially, this is the next best thing," Sumpter said. "This is a great example of the private sector merging with the public sector for the good of the community."

For civilians, gun safety coincides with practice and familiarity.

"This is structured, organized and controlled," Sumpter said of the new shooting range. "Frankly, I think it's a safer way to practice than to take a truck full of guys and go to the mountains."

Learn more

- Federal Way Discount Guns and Indoor Range is located at 1401 S. 324th St. The range is open 10 a.m. to 9 p.m. Monday through Sunday, except holidays. Call (253) 927-5229.
- The Armed Defense Training Association (ADTA) is based in Federal Way. The group sponsors regular events at local shooting ranges. Monthly meetings focus on the safety and educational aspects of gun ownership. Contact (206) 979-9877 or ed@edstreitimages.com or visit ArmedDefense.org.

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Monday, April 23, 2012

Company to bring commercial indoor gun range to Lewisville

by Heather M. Goodwin of *Star Local News*

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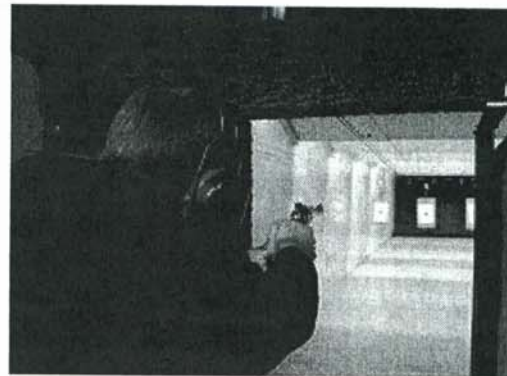
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The Lewisville indoor gun range will have something no other commercial indoor range has -- air conditioning.

Lewisville will soon get its first civilian gun range following a unanimous vote during Monday's city council meeting.

Eagle Gun Range, Inc. requested rezoning of the property located at 501 West Valley Ridge Boulevard, where the indoor gun range will be located. The company requested a zone change from light industrial to specific use district zoning.

The property is surrounded by like zoning to the east, west, and south and the Kansas City Southern Railroad Line to the north.



"I'm just really glad they're here. I'm an avid shooter, and it looks like it will be a really good design," said Councilman John Gorena.

Action Target, Inc., the company designing the indoor gun range, also designed the Lewisville Police Department's firing range and other surrounding city police ranges including Grand Prairie, Arlington, Dallas County Sheriff Department, Frisco, Garland,

Mesquite, Seagoville, Rockwall, Fort Worth, Dallas, N.E. Texas Community College, Plano, Wichita Falls, and the Federal Reserve Bank. The renovated building will include two bays containing a total of 24 firing lanes, two rooms for classroom instruction, an employee lounge area, two offices, bathrooms, and a sales counter. The firing range will be a 25-yard fixed position shooting range, with steel ballistic walls meant to contain the sound.

In addition, steel ballistic baffles will be installed overhead to prevent any accidental discharge of a firearm from leaving the shooting area. At the end of each shooting bay, there will be approximately two feet of chopped rubber spread on top of an angled support structure to create a backstop to catch bullets fired into it. The backdrop will be 10 feet high and four feet thick from the point of bullet entry to the back of the steel support wall. Surrounding the two bays will be a ballistic wall that is constructed with concrete-filled CMU blocks reinforced with steel rods. The gun range will have rules regulating the types and power level of firearms as well as the varieties of ammunition that will be allowed to be used.

Staff at the facility will check firearms and ammunition as users enter the building. The facility will also employ range safety officers and security cameras on each lane.

The Lewisville indoor gun range will also have something no other commercial indoor range has -- air conditioning. Eagle Gun Range plans to have state-of-the-art ventilation, heating and cooling systems. The indoor gun range is anticipated to be larger than most other venues in DFW and accommodate more than 1,500 shooters per week.

"I'm so excited about the opportunity to have this first-class gun range in Lewisville," said resident Brenda Latham. "I am super impressed with the homework and research they have done, even going around to the neighbors. This will put Lewisville on the map for a good reason."

The range must comply with regulations from other governmental agencies such as the Environmental Protection Agency (EPA), Occupational Safety and Health Agency (OSHA), the National Institute of Occupational Safety and Health (NIOSH), and the Center for Disease Control (CDC). The EPA controls the air quality around the facility, while OSHA governs employee working conditions (noise exposure, exposure to lead, etc.). NIOSH regulates airborne lead concentrations, noise levels, and ventilation rates. There is to be no outdoor discharge of firearms at this range. Removal of spent bullets will be contracted to an outside vendor, further limiting employee exposure to lead.

In a memo, LPD Chief Russ Kerbow wrote that the only significant concern the police department had was in regards to potential noise complaints.

"Several members of my senior staff reviewed the plans concerning the proposed new gun range on Valley Ridge including an officer trained in the principles of Crime Prevention through Environmental Design (CPTED). Our concern for an indoor gun range is about any noise that may come from within the structure," Kerbow wrote. "The proposed location is within a mile of residential homes but is surrounded by buildings and a raised railroad trestle, so it is our belief that any sound carrying from the structure is minimized and not likely to result in complaints. It's my understanding that they will install air handling equipment and a bullet trap that will safely capture spent bullets."

James Kunke, community relations and tourism director, said this will be the first indoor public gun range in Denton County. The company plans to start work in May and hopes to open in the fall.

"I'm very active in the shooting sports, and I think this will bring a lot of people to Lewisville," said Jerry Rayburn, Lewisville resident. "I think it will be an extremely well-run operation."



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Utah

Over resident objections, South Jordan OKs indoor gun range

Recreation » Council votes 4-1 despite two appeals targeting noise and impact on health.

By Cathy Mckittrick | The Salt Lake Tribune

First Published Nov 22 2012 07:40 pm • Last Updated Feb 01 2013 02:43 pm

South Jordan • After battling two appeals from nearby homeowners, gun enthusiasts gained approval this week from the City Council to build a large indoor shooting range less than 150 feet from a neighborhood where close to three dozen children live and play.

A company named Gun Vault LLC intends to erect a 13,788-square foot facility that will accommodate 15 target lanes, classroom space, a retail shop and a large social area with shooting simulators.

After a closed session to consider imminent litigation, council members approved the new "recreational" business in a 4-1 vote.

At a glance

South Jordan to get indoor gun range

The 15-lane, two-story facility will be built on 1.6 acres at about 1200 W South Jordan Parkway. Zoned as "community-commercial," the land borders a residential area, and the venture gained approval as a conditional

Resident Kevin Funk had urged the council to "decide for the people." He and other homeowners raised concerns about the range's potential impacts — noise, lead pollution from exploding bullets and declining property values.

"We've learned that the effects of lead are very damaging to children . . . that the cognitive impacts are irreversible," Funk said, clutching several studies on the issue.

"recreational" use, with the requirement that sounds and impact on the air be mitigated

Source: South Jordan City

Join the Discussion

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Charles Beck, an orthopedic surgeon who practices at Jordan Valley Medical Center, is one of the Gun Vault's principals. On Tuesday he sought to allay their concerns.

"The people who are most at risk for lead in this entire situation are all those who are in the gun range, not those who are outside," Beck said. "Our filtered air will be put out into the environment with minute amounts of lead."

Bill Provencher, president of Carey's Small Arms Range Ventilation, defended the Gun Vault's ability to mitigate the adverse sound and air pollutants, both for users and neighbors. His company teamed with SSC Engineering, Inc. of Chesterfield, Mo., to provide data to the city.

"There are three standards we use," Provencher said, referring to engineering standards and regulations from the Environmental Protection Agency and the Occupational Safety and Health Administration.

Carey's has installed high-efficiency particulate air (HEPA) filters in more than 40 small-arms range ventilation systems, and Provencher said they effectively remove particles greater than .3 micrometers in size.

story continues below

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Published Feb 7, 2013 12:49:02PM

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Published Feb 7, 2013 12:46:02PM

However, smaller lead particles would not be captured and they pose the greatest concern, said Brian Moench, a physician who heads up Utah Physicians for a Healthy Environment.

"Research on lead's toxicity has revealed smaller and smaller exposures can do serious damage," Moench said, noting that the Centers for Disease Control and Prevention considers any measurable blood levels of lead to have irreversible, deleterious effects.

The American Academy of Pediatrics has also said there is no safe level of lead exposure for children, Moench added. Children age six and younger are particularly susceptible to lead poisoning, he added, and life-long damage can include IQ loss, behavioral problems, and memory and attention disorders.

However, state regulators cleared the path for the shooting range to advance, saying it would operate well within set bounds for lead pollution.

The federal requirement for monitoring lead emissions applies to sources that involve one-half ton, or 1,000 pounds, per year, said Dave McNeill, planning branch manager for the Utah Division of Air Quality, in an email to Salt Lake health officials. Only primary lead smelters, metal foundries or a heavy concentration of airplanes fueled by leaded gasoline could emit that much lead, he said.

According to the SSC report, along with data compiled by the Rocky Mountain Center for Occupational and Environmental Health, the gun range is predicted to emit .12 to 3 pounds of lead per year.

"We would not require lead monitoring at this source," wrote McNeill.

The SSC report estimated that about 6 million rounds of ammunition would be fired per year. But South Jordan resident Randy Hughes said he believes those numbers reflect 17 percent utilization of the new facility, which he expects would fall well below the desired break-even point.

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Back

SHARE

Despite objections, South Jordan welcomes a new gun range

By Nathaniel Bingaman 35 days ago 427 views



This building purchased by the Gun Vault, will no longer house rugs, but guns in the coming months.

South Jordan is about to get its first indoor gun range. Its creator, John Maynard, believes the state-of-the-art range is the "best in the West." But some residents see it as a possible nuisance and even a danger.

The Gun Vault will be located at 1231 West South Jordan Parkway. The existing 13,788-square-foot building is 150 feet away from a residential area.

The new range will feature 15 shooting lanes, along with a retail store with guns and gun accessories. The building will also house classrooms where gun enthusiasts will be able to take classes for concealed weapons permits, hunter safety and gun safety. The retail store will open in March, and the shooting range will be open in April.

"Our goal is to bring different segments of the shooting community together," Maynard said.

Although Maynard said he is looking to make this a community resource, some residents are concerned it may be a hazard.

Randy Hughes lives next to where the Gun Vault will operate. His main concern is the danger of lead being put into the air by the range.

"All we want to know is that this thing is not noisy, smelly or unsafe," he said. "If it is going to be a danger to the elderly or pregnant mothers, then it has no place here."

The Rocky Mountain Center for Occupational and Environmental Health, which presented its findings to the city council, expects the Gun Vault to emit a maximum of three pounds of lead a year. Federal law requires monitoring for sources that emit 1,000 pounds or more per year.

Maynard is working with Carey's Heating and Air Conditioning, Inc., a company which has built over 300 small arms range ventilation systems throughout the country, primarily for military and law enforcement.

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"We have multi-stage HEPA filters—the best money can buy," he said.
 "We will have no problem staying under limits."

The amount of noise emanating from the shooting range is also a concern for residents. Scott Matheson operates a veterinary clinic 200 feet from the site.

"I treat animals every day for sound and noise phobias, and this is a big problem for us," he said. "I have read where some of these facilities have really good soundproofing. Maybe they will; maybe they won't."

Matheson worries about the impact of the new shooting range on his business.

"This worries me because we just spent \$2.5 million and five years of planning to open this facility. This could kill our facility dead as a doornail," he said

Maynard believes that this will be the quietest gun range in the western United States. He said his people have built a "box within a box"—the gun range is basically a separate building inside the main building.

The Gun Vault was approved by the city council in a 4-1 vote on Nov. 20, on the condition it comply with the Salt Lake County Health Department's rules regarding sound and lead and meets the Utah Department of Air Quality's lead standards.

Councilmember Mark Seethaler was the only council member who voted against the gun range.

"We represent people, their lives, their homes and interests," he said. "There is not one right clear answer in everything we do. This has both a personal and a business rights element."

Hughes is working with The Office of the Property Rights Ombudsman, to see if there is anything else he can do to ensure that the facility is safe for South Jordan residents.

"If I find out it is safe, I will shut up," he said.

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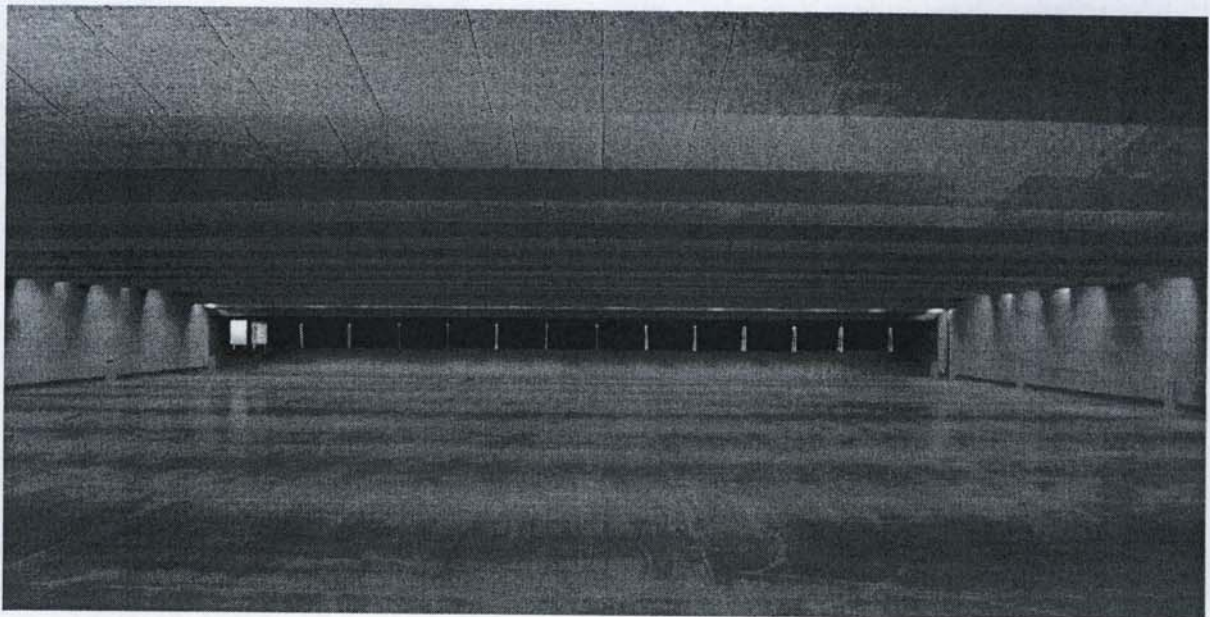
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Troy Acoustics Corporation
2580 Sidney Lanier Drive
Brunswick, GA 31525
800-987-3306
www.troyacoustics.com

A Primer on Indoor Shooting Range Acoustics

By Stephen Katz, Vice President, Research and Technology, Troy Acoustics



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A Primer on Indoor Shooting Range Acoustics

By Stephen Katz, Vice President, Research and Technology, Troy Acoustics

Executive Summary

Loud noise is hazardous to your health! Intensely loud noise as found on indoor shooting ranges is extremely hazardous to the health of anyone who trains, instructs, or is just a recreational shooter.

Hearing protection is not enough, even double protection. Exposure to intense sound fields, besides leading to hearing loss and tinnitus, impacts the whole body with the most common indications being fatigue and headaches. Longer exposure may lead to hypertension, heart disease, anxiety, headaches, judgment impairment, sleep disturbance, and other conditions that can lead to disability claims and lawsuits.

The only way to protect the "whole" person is through engineering noise controls. OSHA's noise standards specify that feasible engineering controls must be used to reduce noise to acceptable levels and that personal protective equipment, such as ear plugs and ear muffs, must be used only as supplements. It's only a matter of time before OSHA enforces this standard.

There are benefits beyond protection of the health and well-being of persons that work on and use indoor shooting ranges. Safe sound levels mean you can train and work harder, shoot longer and create an environment that is healthy for the whole family.

What are engineering noise controls for indoor shooting ranges? It can be summed up with one word, **acoustics**.

Caveat emptor, "buyer beware". There are many acoustical products and treatments being marketed and sold that claim to be effective on indoor shooting ranges but clearly are not.

Not all acoustical products are created equal. There are many issues that need to be addressed when choosing the right products for shooting ranges; sound absorption, absorption in intense sound fields, sound reflection, sound transmission, material density, porosity, tortuosity, bullet absorption, ricochet, splash back, combustibility, flame spread, smoke developed, mold and mildew resistance, ease of cleaning and maintenance, durability, and the manufacturers warranties and guaranties.

You want to treat your range just once, and get it right.

Indoor shooting range noise can effectively be controlled through proper engineering and the right choice of products and their placement.

Troy Acoustics, the worldwide leader in shooting range acoustics, offers the world's highest acoustic rating and the shooting range industry's only guaranteed solution. Only Troy is able to meet all the issues defined above. The benefits and impact of proper acoustic treatment will be felt and appreciated for years and years to come.

What is Sound?

Sound is a mechanical wave that is an oscillation of pressure transmitted through a solid, liquid, or gas, composed of frequencies within the range of hearing and of a level sufficiently strong to be heard, or the sensation stimulated in organs of hearing by such vibrations¹.

Sound can also impact the whole body, especially low frequency sound. Have you ever been to a movie in Dolby 5.1? The theater shakes. How about at a dance club or a rock concert, or a symphony orchestra? All those can be fun, invigorating uses of sound. They can also become uncomfortable, even painful. That's when sound becomes **noise!**

What is Noise?

Noise is a sound that disturbs or harms. Noise is one of the most common occupational and recreational health hazards. "The government paid out approximately \$1.1 billion in VA disability compensation for tinnitus in 2010. At the current rate of increase, service-connected disability payments to veterans with tinnitus will cost \$2.26 billion annually by 2014.²" Nonmilitary ranges pay the price in increased workers' compensation and insurance payments, and then there are the lawsuits.

Hearing protection, even double protection can offer only so much personal defense. While hearing protection covers the ears, the rest of the body, particularly the skeleton transmits the sound to the ear canal through bone conduction. That is why the highest rating for the best double hearing protection is barely over 30 dB.

¹ <http://en.wikipedia.org/wiki/Sound>

² Testimony before a March 2012 joint session of the House and Senate Committees on Veterans Affairs

Physiological effects of noise on the human body are not part of the OSHA/NIOSH standards. However, these effects can and will cause illness to personnel using the range if acoustically untreated. The symptoms range from cardiovascular effects such as myocardial infarction. This is brought on by elevated levels of cortisol production. Cortisol production within the human body is brought on by heightened stress levels which are directly related to long exposure to high sound levels. Increased blood pressure levels are brought on by the elevated heart rate, which is another reaction as the muscular walls contract to the high intensity of sound waves.

Our chest is a natural resonator that amplifies low frequency noise. The resonant gain for the chest vibrations is about 25dB occurring in the frequency range from about 30Hz to 80Hz, depending on stature and gender. There is current research that has shown links between traumatic brain injury and ballistic pressure waves originating in the thoracic cavity and extremities.

Other effects of exposure to high intensity noise are increased frequency of headaches, fatigue, irritability, anxiety, judgment impairment, sleep disturbance, stomach ulcers and vertigo.

Types of Noise

Noise is categorized in two ways; continuous/steady state, and impulsive. Shooting range noise comes under impulsive noise, as the actual noise generated by small arms fire is of very short duration, on the order of a few milliseconds. Experience has shown that impulse noise may be more harmful to hearing than continuous, steady state noise.³

Table 1 below shows the range of human hearing relative to various sound sources as expressed in Sound Pressure Level (SPL) in decibels (dB). The range is from the soft sound of leaves rustling in the distance to the crack of a 5.56 rifle as heard by a shooter.

³ Schwetz F, Hloch Th, Schewczik R. "Experimental exposure to impulse noise in the especially pathogenic impact frequency range." Acta Otolaryngol 1979;87:264-6

Table 1

dB SPL	Sound Sources
155	Gun fire as heard by the shooter
140	Jet on carrier deck
130	Threshold of pain
120	Threshold of discomfort
110	Chainsaw, 1 m distance
100	Disco, 1 m from speaker
90	Diesel truck, 10 m away
80	Busy traffic
70	Vacuum cleaner, distance 1 m
60	Normal conversation
50	Average home
40	Mosquito buzzing
30	Quiet bedroom at night
20	Whisper (at 1 m)
10	Rustling leaves in the distance
0	Threshold of hearing

What Makes Up The Sound of Small Arms Fire?

The speed of sound at sea level, in dry air at 68 °F is 1,126 feet per second. This works out to 768 miles per hour (mph), or approximately one mile in five seconds. The muzzle velocity of just about every caliber rifle and shotgun will exceed the speed of sound as well as some handguns.

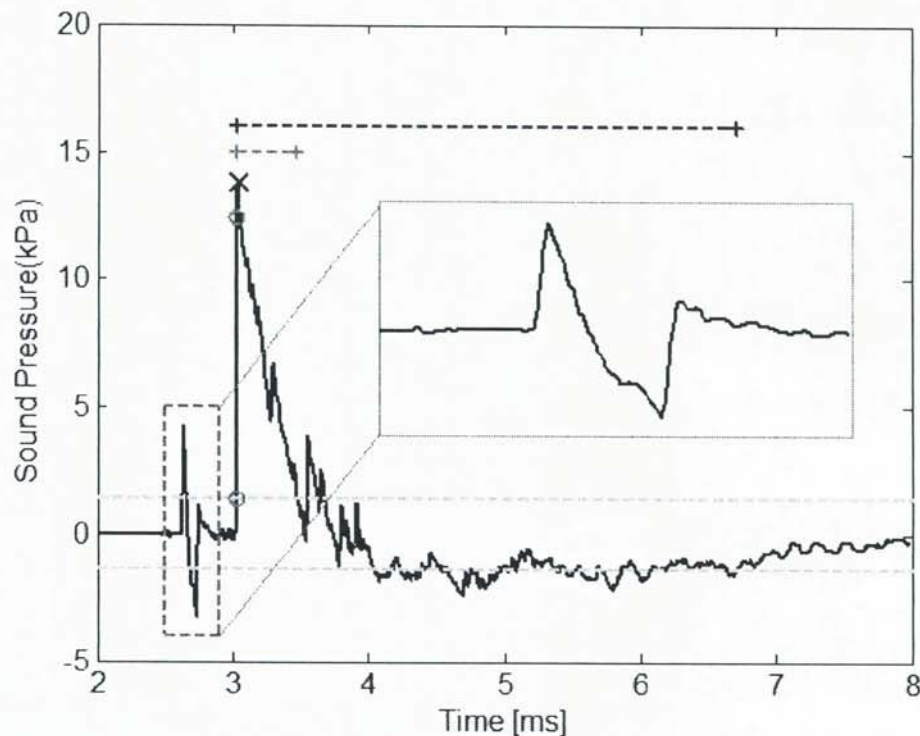
Table 2 below shows some common ammunition and their muzzle velocity. All but the 38 and 45 caliber break the sound barrier (supersonic), with the Ruger 204 hitting a blistering Mach 3.5. It stands to reason that the faster the round the louder the sound.

Table 2

Rifle Ammunition	Velocity f/s	Mach
17 HMR 17 gr. V-MAX	2250	2.00
204 Ruger 40 gr. V-MAX	3900	3.46
22 Hornet 35 gr. V-MAX	3100	2.75
223 Rem 75 gr. TAP-FPD	2790	2.48
22-250 Rem 60 gr. SP	3600	3.20
243 Win 100 gr. BTSP InterLock	2960	2.63
257 Roberts 117 gr. BTSP InterLock	2780	2.47
25-06 Rem 117 gr. BTSP LM InterLock	3110	2.76
270 Win 150 gr. SP InterLock	2840	2.52
7MM Rem Mag 154 gr. SST InterLock	3035	2.70
30-30 Win 160 gr. Evolution	2400	2.13
308 Win 168 gr. TAP-FPD	2700	2.40
30-06 Sprg 165 gr. BTSP LM InterLock	3015	2.68
300 Win Mag 180 gr. SP HM InterLock	3100	2.75
5.56x45mm NATO 55 gr FMJ	3240	2.88
7.62x51mm NATO 147 gr FMJ	2800	2.49
12GA 00 buckshot 53 gr .32"	1325	1.18
12GA 480 gr rifled lead HP slug	1600	1.42
Handgun Ammunition		
9MM Luger 115 gr. JHP/XTP	1155	1.03
38 Special 125 gr. JHP/XTP	900	0.80
40 S&W 155 gr. JHP/XTP	1180	1.05
45 Auto 185 gr. JHP/XTP	970	0.86
45 Colt 255 gr. Cowboy	725	0.64
500 S&W 300 gr. EVOLUTION	2075	1.84

Figure 1 below is a representative of a centerfire rifle, sound-pressure time series. The measurement was made outdoors in a non-reverberant environment. First is the bullet supersonic shock wave (red outline and inset plot), muzzle blast rise time (red circles), peak overpressure (blue X), A-duration (magenta dashed line), and B-duration (blue dashed line) are illustrated. (The green dashed lines are the 20 dB down points, in absolute value, from the peak overpressure and are used to calculate the A- and B-durations.)⁴ Typical rise times for center small arms are typically from four (4) to seven (7) microseconds (us). The fast rise times dictates the need for special equipment to accurately measure shooting range sound.

Figure 1⁵



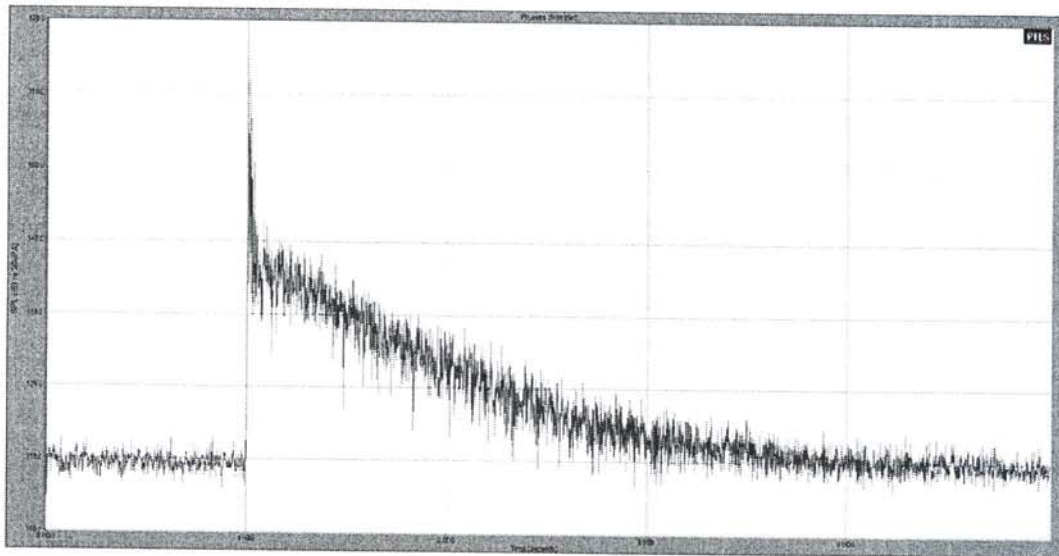
From the time series above we see the basic elements that make up small arms fire. The first component is the supersonic shock wave closely followed by muzzle blast rise time, peak overpressure, then the sound ring out, known as reverberation time. In this case, as the weapon was measured outdoors in a non-reverberant environment the reverberation time was on the order of a few hundred milliseconds.

⁴ "Investigating the source characteristics of gunshot noise Investigating the source characteristics of gunshot noise," Andrew R. Barnard, H. John Camin, David M. Kiger, Penn State University / Applied Research Laboratory

⁵ *Ibid*



Figure 2



Reverberation is nature's amplifier. Think of clapping your hands in the middle of nowhere versus clapping your hands in a parking garage. The clap is the same; the reverberation makes the sound many, many times louder. The problem is compounded when there are multiple shooters present.

Conventional sound level meters are not fast enough to fully capture the sound of a gunshot. When you use a meter slower than the event a lower sound pressure will be recorded. In tests comparing a conventional sound level meter to a high speed digital recording, the errors noted were from three (3) to six (6) dB SPL. A 6 dB difference represents underreporting of the actual sound pressure by half, a significant error.

The microphone selected is also very critical to measuring a shooting range. As most small arms produce an instantaneous over pressure of 160 dB SPL or more, a microphone with a dynamic range of 170 dB or greater should be used. Typically these microphones will have a 1/4" or 1/8" capsule with a high-level preamplifier. If the microphone/preamp used does not have enough dynamic range it will clip the impulse, again underreporting of the actual sound pressure.

In order to accurately capture impulse overpressure wave of small arms fire, a meter or recording device should have a response time on the order of eight-microseconds (8 us). Today, two-channel high-speed analog to digital converters can be purchased for less than three-hundred dollars (\$300). They sample up to 192 thousand samples per-second which equates to a sample every 5.2 microseconds, enough to accurately capture the sound of small arms fire.

There are easy to use two-channel digital sound recording and complete post analysis software packages that will run on your laptop currently available for under \$1,500. They can report any current measurement standard and will upgrade as new standards are developed.

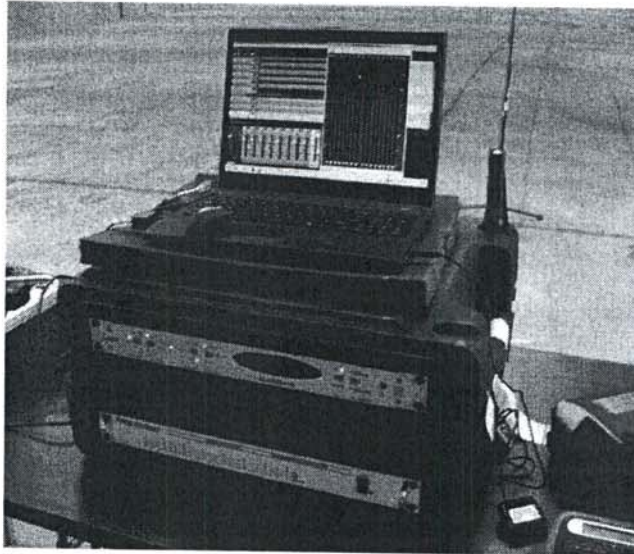
Picture 1 below shows a portable 16 channel high-speed (192k) recording rig developed by Troy Acoustics. The upper unit in the rack is a Lynx Studio Technology: Aurora 16, 16 channel AD/DA converter with Lynx LT-MADI⁶. The LT-MADI provides digital input and output in MADI (Multichannel Audio Digital Interface) format. The MADI is sent via optical fiber to the laptop to where it is recorded.

The lower unit in the rack is a PCB Model 483C05 8-channel, line-powered, ICP® sensor signal conditioner. There are currently two of these units in the rack pictured for 16 microphones and/or sensors.⁷

⁶ http://www.lynxstudio.com/product_detail.asp?i=1

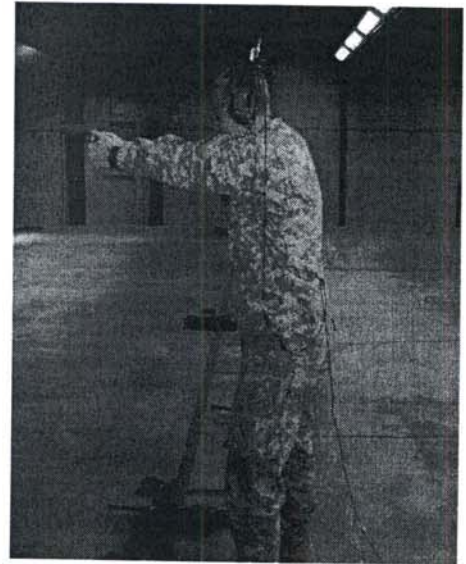
⁷ http://www.pcb.com/spec_sheet.asp?model=483C05&item_id=14291

Picture 1



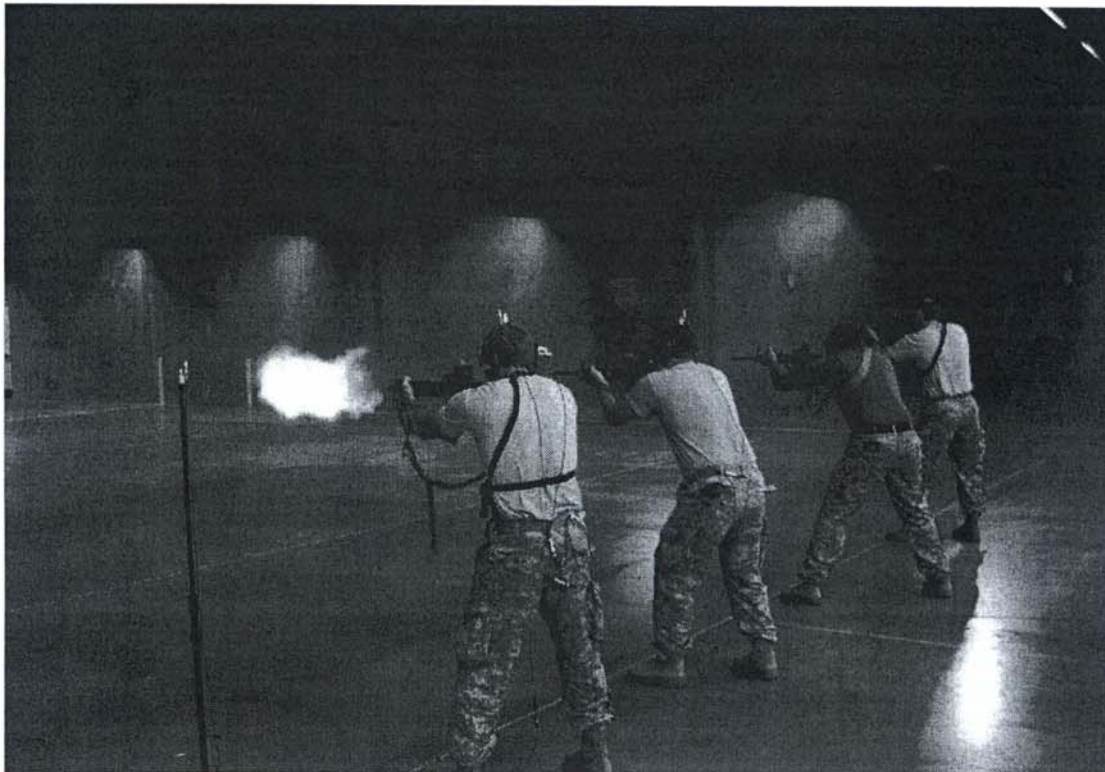
Picture 2 on the right shows a shooter wearing a Personal Mounted Microphone (PMM) designed and built by Troy Acoustics. The placement of the microphone is always a difficult decision especially as consistency and repeatability is a major concern in shooting range measurement. When microphones are placed on a stand next to the shooter the issue is that every shooters stance is different so their position relative to the microphone will vary. The PMM offers a consistency relative to the shooters ears. This is very useful in evaluation of a range pre and post acoustic treatment where the same shooters may not be available.

Picture 2



Picture 3 below shows multiple shooters firing at the same time. The microphone on the stand on the left is for measuring RT60 and stays in place as the shooters move to various positions in the range. The shooter on the left in addition to having a Personal Mounted Microphone mounted to his hard hearing protection there is also a pressure sensor mounted to the temple region. The concept of using pressure sensors was pioneered by Troy Acoustics. The purpose of the pressure sensor is to gauge the effect on the shooter from the shooter in the adjacent lane. Pressure sensors are used for this purpose; as a microphone cannot be directed at a high-level source as its diaphragm will be bottomed out by the impulse overblast pressure wave where a piezoelectric pressure sensor will not. This author currently utilizes four (4) Personal Mounted Microphones for range testing, three shooters and an instructor, plus four (4) fixed microphone positions, and three (3) piezoelectric pressure sensors on the shooter in the center lane, one on each temple, and one on the sternum.

Picture 3



What Metrics Are Used To Measure A Shooting Range?

Sound pressure level (SPL) is a logarithmic measure of the effective sound pressure of a sound relative to a reference value measured in decibels (dB). The commonly used "zero" reference sound pressure in air is 20 μ Pa RMS, which is considered the threshold of human hearing. When looking at a time series such as in *Figure 1* or *Figure 2* the peak sound pressure level is the highest point. In figure 2 the peak level was 164.9 dB.

The peak sound pressure level can be used to calculate other metrics such as Equivalent Continuous Level (Leq). Leq represents the average energy over a period of time. Typically OSHA will look at sound averaged over 8 hours, Leq8. While it is possible to average a single impulse over 8 hours it is questionable as to its value as who only fires one shot.

A-Weighting - There are those who use "A-weighting" to analyze peak sound pressure levels and calculate Leq (LAeq). A-weighting refers to the high and low-frequency filtering of a signal with a low-frequency roll off that starts at 1 kHz and is down 10 dB at 125 Hz. A-weighting is commonly used to emphasize frequencies around 3–6 kHz where the human ear is most sensitive, while attenuating very high and very low frequencies to which the ear is insensitive. The issue is the most significant energy generated by small arms fire is between 100 Hz and 400 Hz.

There are those who question the use of A-weighting. While it is in common use for assessing potential hearing damage caused by loud noise, this seems to be based on the widespread availability of sound level meters incorporating A-Weighting rather than on any good experimental evidence to suggest that such use is valid⁸.

Reverberation Time (RT60) Reverberation is the persistence of sound in a particular space after the original sound is produced. It is created when a sound is produced in an enclosed space and a large number of repeats of the same sound build up and then slowly decay as the sound is absorbed by the walls and air. Reverberation Time, RT60 is the time required for the reflections of a direct sound to decay by 60 dB below the level of the originating sound. The more shooters there are the more sound that is produced on the range as the repeats build it to higher and higher levels.

⁸ http://en.wikipedia.org/wiki/Weighting_filter

B-duration, for impact noise, the two principal descriptors are the highest peak in a series of successive peaks (reverberations) and the so-called B-duration, the duration from the highest peak level to a point in time when the reverberations have decayed either 10 or 20 dB. B-durations range from 50 to 300+ milliseconds (ms). The distinction between impulse and impact noise becomes blurred in many real-life situations because impulse noise can reflect off the ground, or other surfaces, and the reflections add to the initial impulse noise, creating a large, more complicated waveform that is best described using the B-duration.⁹ An example of B-duration can be seen in *Figure 1*.

Allowable Number of Rounds (ANOR) as defined in Department of Defense Design Criteria Standard, Noise Limits, MIL-STD-1474D uses the peak pressure level in dB SPL, and the B-duration to calculate an allowable number of rounds (ANOR) that can be fired in a 24-hour period without a significant risk of hearing loss. These formulas assume that a certain level of hearing protection will be used by personnel exposed to the weapons noise.¹⁰

Pressure Time

Pressure Time (PSI(t)) is a metric advocated by Troy Acoustics to compare shooting range acoustics before and after acoustic treatment. MIL-STD-1474D only refers to a hearing conservation criterion. To better understand the impact on the whole body the metrics **Pound-Force per Square Inch (psi)** and **Pound-Force per Square Inch Time (psi(t))**¹¹ can be used to evaluate shooting ranges and gauge the amount of improvement from sound absorption/noise abatement treatment. Pressure Time measurement advantages include:

- Psi(t) gives an actual representation of the total energy generated within the range
- Psi(t) gives an accurate representation of the effect of multiple shooters firing multiple rounds
- Psi(t) gives an accurate representation of automatic and semiautomatic fire, single or multiple shooters
- Psi(t) can be used to compare any range whether acoustically treated or not

⁹ Hamernik and Hsueh, 1991

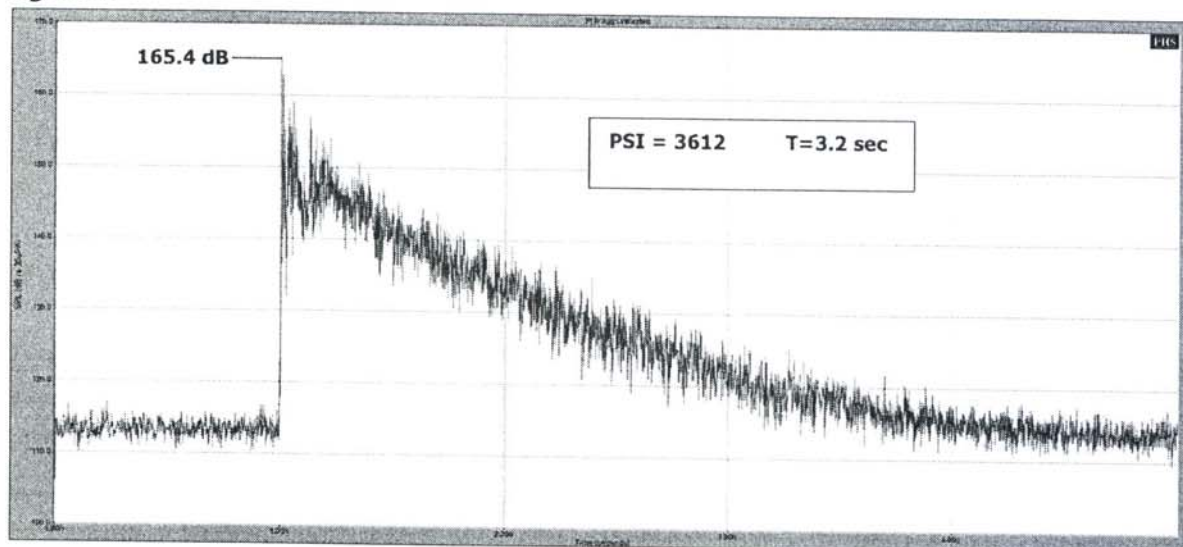
¹⁰ Jokel, "Criteria and Procedures for Auditory Health Hazard Assessment of Impulse Noise (Blast Over Pressure)," U.S. Army Public Health Command Technical Guide No. 338, Feb 2012

¹¹ psi(t) is the integer of the area under the peak pressure curve (in Pa) times the total event duration in seconds with the formula $\text{psi}(t) = Z_n \left(\int f(x) dx (\text{sec}) \right)$

- Psi(t) is an excellent way to compare an indoor or outdoor acoustically untreated range to an acoustically treated range to gauge performance and improvement
- Psi(t) clearly expresses the effect on the total human physiology not just hearing

Figure 3 below is a time series of seven shooters (7) each firing one-round on an M4 5.56 on an untreated fifty-meter (50m) indoor shooting range. The peak level is 165.4 dB SPL. The total pressure is 3612 PSI for 3.2 seconds for a PSI(t) of 11433 equating to 175.1 dB.

Figure 3



How Acoustically To Treat an Indoor Shooting Range

There are several goals that must be achieved to meet all standards and protect the whole person when acoustically treating an indoor shooting range:

- Use products with significant density that offer the maximum amount of sound absorption at all frequencies and that are capable of maintaining their absorption coefficient at high-intensity sound levels
- Do not use a product that absorbs some frequencies and reflects back others
- Use products that are capable of absorbing low-frequencies
- Treat 75% or more of all exposed surfaces
- Reduce the Reverberation Time (RT60) to 1.3 seconds or less
- Keep the sound of the range from getting into adjoining spaces and leaving the building

- Materials used must allow bullets to penetrate or pass without ricochet or splash back, and without noticeable deformation of system
- Products must be highly rated as to combustibility, flame spread, smoke developed, mold and mildew resistance, ease of cleaning and maintenance, durability
- All acoustic materials should be warranted and guaranteed by the manufacturer as to their specific performance on a shooting range

Material Specifications

Noise Reduction Coefficient (NRC) is a scalar representation of the amount of sound energy absorbed upon striking a particular surface. An NRC of 0 indicates perfect reflection; an NRC of 1 indicates perfect absorption.¹² The acoustical material selected should have a NRC of 0.85 or higher based on tests at 16 third-octave band frequencies from 125 to 4,000 hertz (Hz). NRC is being replaced by the Sound Absorption Average (SAA), which is described in the current ASTM C423-09a. The SAA is a single-number rating of sound absorption properties of a material similar to NRC, except that the sound absorption values employed in the averaging are taken at the twelve one-third octave bands from 200 Hz to 2500 Hz, inclusive, and rounding is to the nearest multiple of 0.01.¹³

Material Density: sound absorption and noise abatement material shall be of significant density and porosity to mitigate blast overpressure (BOP) from single and multiple weapon fire with peak amplitudes in excess of 165 dB (SPL) and Pressure Time (PSI(t)) exceeding 10,000 (PSI(t)). Sound boards should have a minimum density of two (2) pounds per square-foot per each inch of thickness. All batt-type sound absorption materials should be mineral based and have a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf) per inch.

¹² <http://www.acoustical.com/documentation/acoustical-education/32-what-is-nrc-stc-and-saa-acoustical-material-distributors-inc>

¹³ <http://www.astm.org/Standards/C423.htm>

Sound Transmission Class (STC) is an integer rating of how well a building partition attenuates airborne sound. STC for a shooting range needs to be determined on a case-by-case basis. Particular care and attention needs to be paid to the wall, window, and door design separating the range control room, classrooms, show room, etc. It is paramount that the sound level reaching these areas be below 85 dB else persons in those areas will be required to wear hearing protection and or be enrolled in a hearing conservation program. Regarding sound leaving the building it is dependent as to where the range is located. It is critical if the range is located in a building with offices and/or other business or in or near residences. If an indoor shooting range is located in the middle of nowhere, not so much.

Not All Acoustic Materials Are Created Equal

Just because a manufacturer tells you that their product will work on an indoor shooting range doesn't make it so. Some products are very good at not allowing bullets to penetrate or pass without ricochet or splash back but acoustically can reflect back as much or more noise than they absorb. Some products offer some sound absorption at low-levels but literally are torn to shreds if hit by a bullet.

Noise Reduction Coefficient (NRC) is a very nebulous standard. To test for NRC you use a known reverberant room. The reverberation time (RT60) is measured in the room without and with a sample of absorptive material being tested. From the differences in the reverberation time (RT60) the NRC is calculated. Even though the reverberation time (RT60) is measured typically from 20 Hz to 20,000 Hz only four-frequencies are averaged to derive the material's NRC, 250 Hz, 500 Hz, 1000 Hz, and 2000 Hz. These frequencies were chosen in the 1930's based on speech intelligibility in an auditorium. They have nothing to do with the complex impulse overblast pressure wave we know as gunfire.

The computation of NRC by averaging the four-speech frequencies by itself is flawed. The standard for NRC is a one-square foot open window which is considered to have an NRC of "one." If the NRC at each of the four-frequencies is equal to .5 the NRC is called .5. If the NRC at 1000 Hz and 2000 Hz is 1 and the NRC at 250 Hz and 500 Hz is 0 the NRC would still be .5. By way of example a thick ham sandwich could have an NRC of 1 at 1000 Hz and 2000 Hz. Is that what you want protecting you in a gun range?

When NRC is measured the sound level put into the reverberant test room is around 85 dB. The sound of gunfire on a range can be over 165 dB! NRC fails to tell you how much you are protected from the high-intensity sound of gun fire.¹⁴

Chart 1 below compares the Noise Reduction Coefficient (NRC) of acoustic products that have been used on shooting ranges. Most of these products exhibit a low NRC in the critical frequency bands below 500 Hz. The Troy System™ shows an NRC of 1.20, significantly higher the next highest NRC 0.60 of acoustic tile. For years acoustic tile has been installed in shooting ranges with very little to no benefit. The benefit of acoustic foam products is also suspect as little is known on how they perform under the influence of intense sound fields found on shooting ranges. Ballistic rubber products are not represented as-to-date, as no ballistic rubber manufacturer has published NRC ratings from an accredited laboratory. It is felt by some that ballistic rubber products actually heighten the noise and pressure in a shooting range. There is also measurement and comparison data that also points to that supposition.

¹⁴ Public Safety Newsletter, June 2010, SHOOTING RANGE NOISE, Higher Absorptive Value provides safer environment for the shooter, S Katz

Chart 1

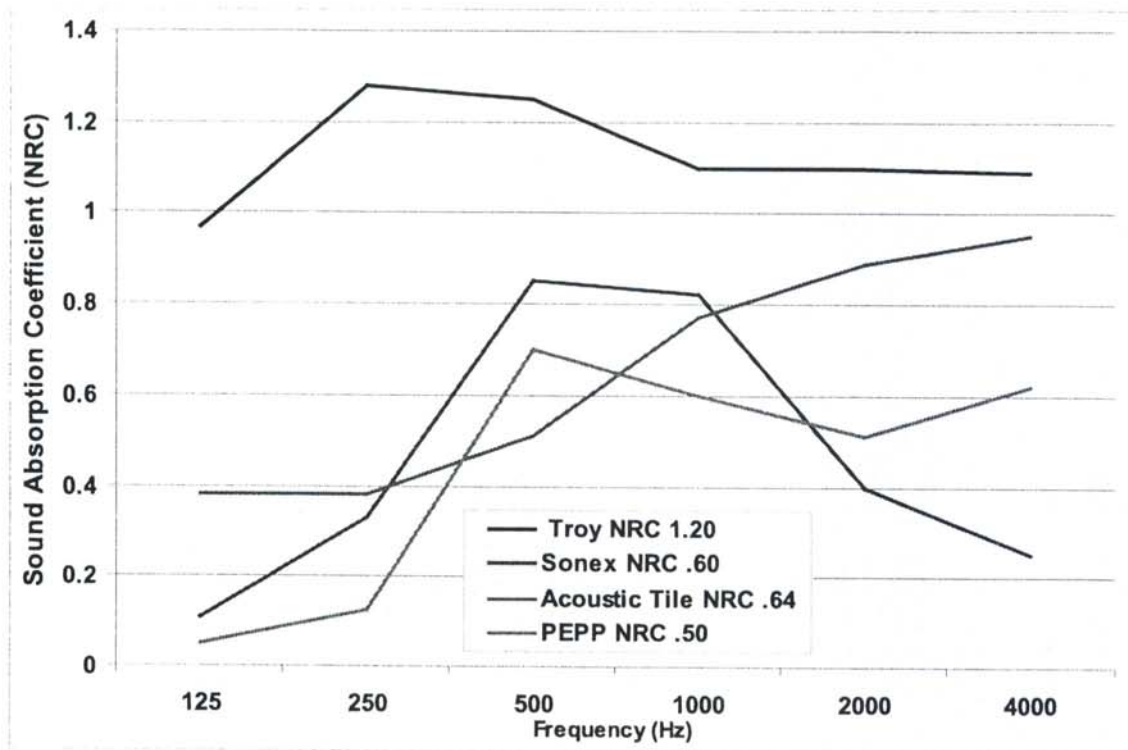


Chart 2 below shows a generic comparison of the reverb time (RT60) in an indoor small arms range that is; treated with wedge foam, PEPP, 2" Rubber, and the Troy System. It can be seen that effectiveness of the PEPP, and 2" Rubber is moderate at mid and frequencies, a steep rise at high frequencies, and almost nonexistent at the critical lower frequencies. The Troy treated range shows an RT60 of less than one-second (1 sec). As Reverberation Time (RT60) is a natural amplifier, if you think of the sound of your car alarm turning on or off in an underground parking versus outdoors, it is easy to see how important reducing the reverberation time in a shooting range is.

"Bang! Bang! Bang! Bang! Bang! Bang!" versus... "Bang! Bang!"

Chart 2

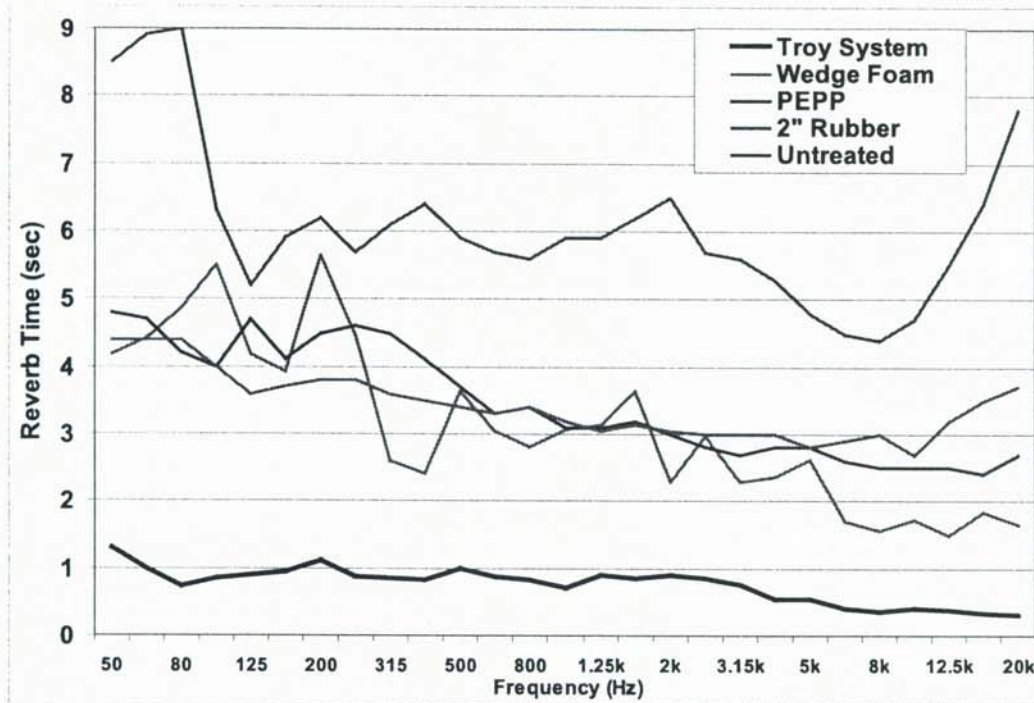


Figure 4 below shows a comparison between the relative pressure in PSI on an untreated (concrete sidewalls, steel baffles) fifty-meter, fourteen-lane indoor shooting range and a ten-lane, twenty-five yard indoor range treated with ballistic rubber, for a single shooter firing a single round of an M4 5.56 rifle.

In each case the shooter was firing from the furthestmost firing-line from the target and nearest to the rearmost wall. We can see that even as the time period is 3.0 seconds for the larger range, the pressure on the shooter is greater on the range treated with ballistic rubber range by 25 psi. It is apparent from this that ballistic rubber is not an ideal acoustic treatment for a shooting range.

Figure 4

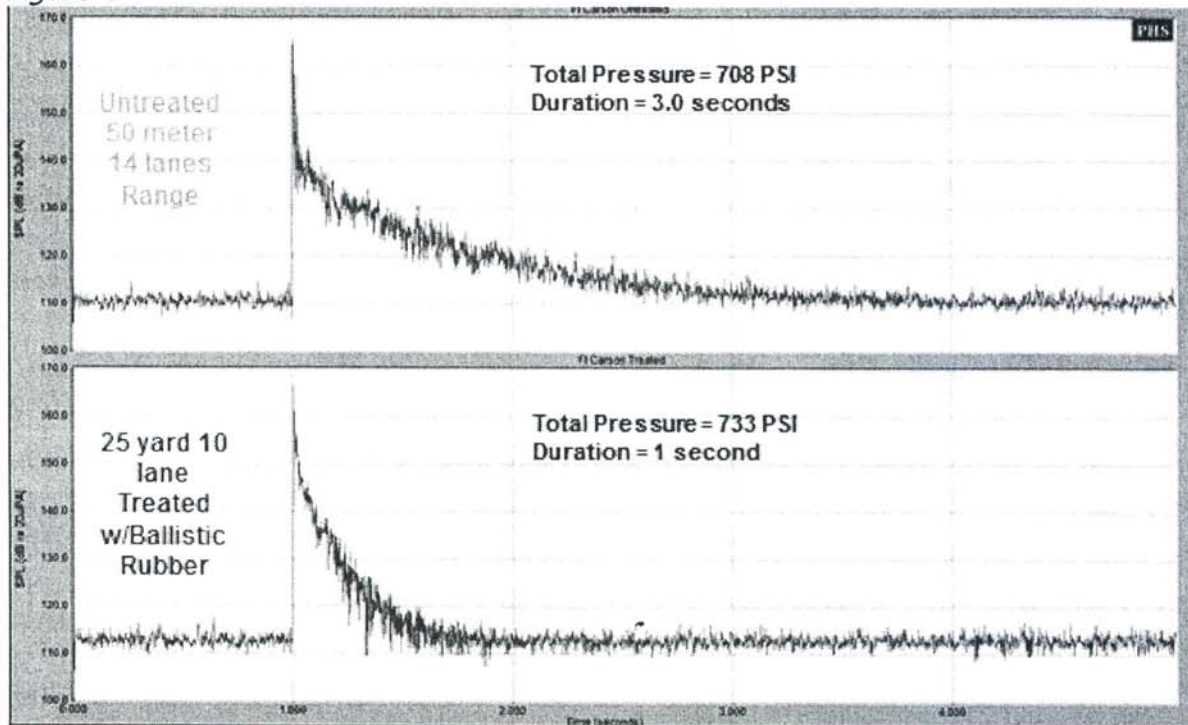


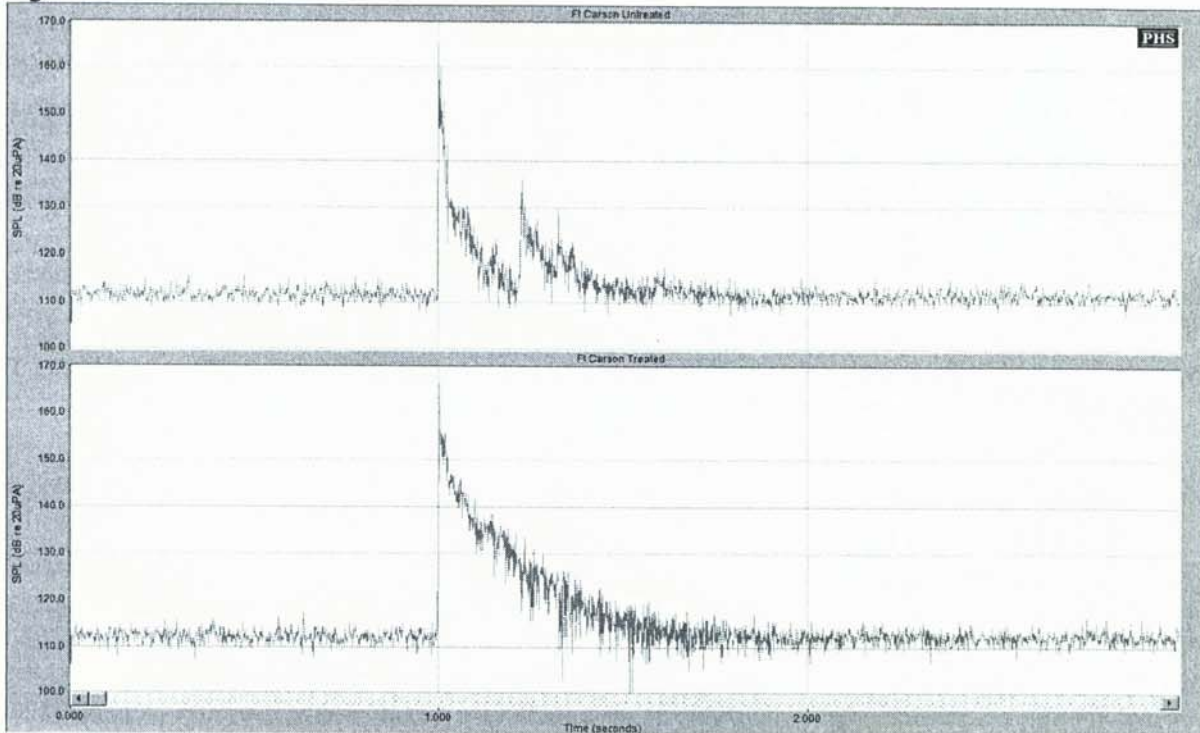
Figure 5 below shows a comparison between the relative pressure in PSI on the same range as above (fifty-meter, fourteen-lane) that has been acoustically treated with the Troy System™ and the same ten-lane, twenty-five yard indoor range treated with ballistic rubber, for a single shooter firing a single round of an M4 5.56 rifle.

The Troy acoustically treated 50-yard range shows a total pressure of 196 psi over one-half of a seconds verses 733 psi over a one-second time period on the 25-yard range that is treated with ballistic rubber, for one shooter firing one round on a M4, 5.56.

The variance of pressure on the shooters' hearing and body in the ballistic rubber treated 25-yard range is 537 psi greater the Troy Treated 50-meter, 14-lane range. This equates to a difference of 374% greater pressure on the shooter which equates to the extreme "loudness" shooters experience on this range.¹⁵

¹⁵ Sgt Lou Salseda formerly Range Master for the Los Angeles Police Department was acting as Range Master when this range was measured and commented that this was the loudest range he had ever heard

Figure 5



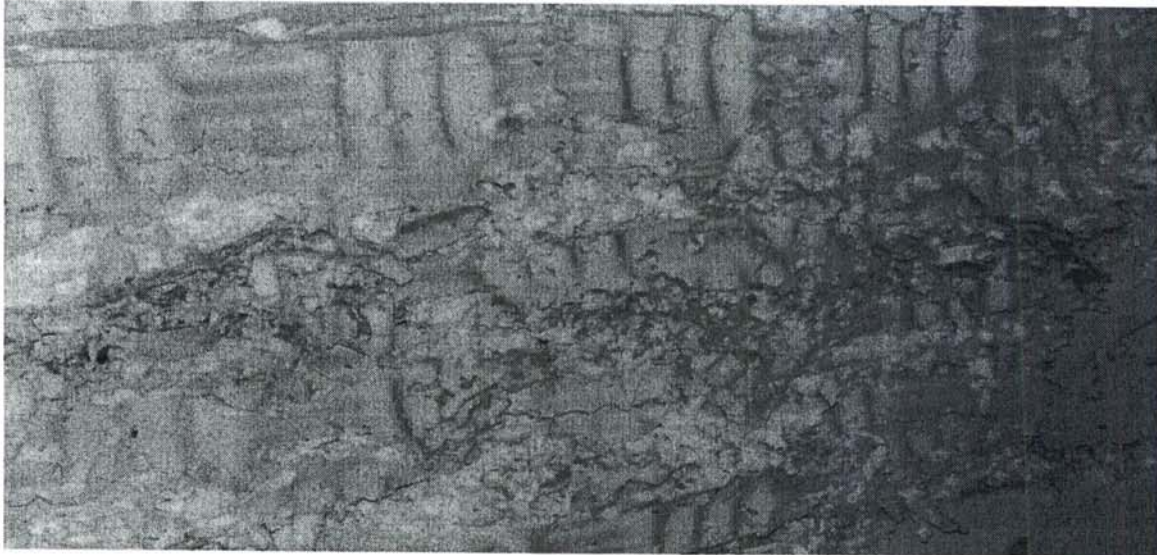
How Do You Acoustically Treat an Indoor Shooting Range?

Acoustically treating an indoor shooting range is not something that should be taken lightly. "*Primum non nocere*," do no harm. There are products that claim to have acoustic properties but can actually make the sound of an indoor shooting range worse. They achieve their noise reduction rating mainly because their product diffuses the sound rather than absorbs it. Rubber products are extremely prone to this. Rather than reduce the sound overpressure pressure on the range they can actually amplify it. There are multiple instances where rubber type products had to be removed because they exacerbated a range's noise problem.

There are products that might slightly change the range acoustics but create dangerous conditions in regards to ricochet and splash back. Foam type products are especially prone to this. The cell structures of foam products are generally not continuous. This discontinuity, low porosity and low tortuosity reduce foam products' ability to fully absorb sound at all frequencies. At extremely high sound pressure levels, as found on shooting ranges, the foam cells become blocked by the impulse overblast pressure wave turning the foam more into a reflector than an absorber. There are also issues with cleaning and lead remediation in ranges with acoustic foam. There are also multiple instances where acoustic foam type products had to be removed because they exacerbated a range's noise problem as well as ballistic, cleaning and lead issues.

Picture 3 below shows foam based acoustic product used on an indoor shooting range after being hit by gunfire.

Picture 3



There are acoustic products that pose fire and smoke hazards. There is a classic story of a brand new three-million dollar (\$3m) military indoor shooting range that was treated with rubber products. As the story goes they were warned not to shoot any tracer type rounds. Not everyone got the message. The range was fully destroyed. The good news was no one was hurt.

There are acoustical products that are prone to mold and mildew and can literally melt in high humidity conditions or if hit by water. Some gypsum based soundboards are especially prone to this. A leak or someone trying to clean it by hosing it down can be catastrophic. High humidity exposure over time can have the same effect. Most manufacturers will put a warning in their literature. Gypsum based soundboards also have an issue with density. If the product is not dense enough its ability to absorb the sound of gunfire, especially multiple shooters will be considerably compromised.

Fiberglass insulation products are not designed for use on shooting ranges, either as a backing or exposed. It is prone to moisture build-up causing mold, mildew and decay. Moisture buildup diminishes fiberglass's acoustical and thermal properties. Exposed fiberglass has potential health risks such as lung damage and bronchial and skin irritation. Fiberglass insulation does not burn but does melt at fairly low temperatures emitting potentially harmful carcinogens.

Additionally, there are acoustical products that can't be cleaned after lead exposure from gunfire. These products may have to be fully remediated and replaced, a very costly proposition.

Yes, cost is always a factor but nothing is as costly as having to do it twice. For reasons of health and safety and yes, cost, get it right the first time.

Types of Indoor Shooting Ranges

Tactical Shooting Ranges are where shooting is permitted from every point on the range (multiple firing lines). These are also known as fully baffled ranges as baffles are continuously placed, in a sawtooth pattern from the end of the safety ceiling to the trap. For a tactical range, as shooters will move both transversely and laterally all performance specifications must be met at any possible firing point within the range.

Fixed Point Shooting Ranges have a single firing line and usually but not always have shooting stalls.

Acoustic Treatment Basics

How Much Acoustic Treatment Do You Need?

Ever shoot outdoors under perfect acoustic conditions, e.g. where there is deep brush and foliage to absorb the sound or in the middle of nowhere with no reflective surfaces for miles and miles.

You can never have too much sound absorption. To fully absorb the sound of gunfire it is imperative that at least 75% of all exposed surfaces be acoustically treated. This is because if you allow reverberation to build up in any area of the range it will increase the overall sound pressure on the entire range.

For a tactical range this means all the baffles, except for the one nearest to the trap, the rear wall, safety ceiling, any area between the safety ceiling and the rear wall, the side walls behind the firing line, and at least fifteen feet in front of the target line nearest to the trap.

You treat a fixed point range the same as a tactical range. The main difference is that there are fewer baffles which are spaced widely apart. Because of that, an isolation ceiling is recommended from the rear wall behind the shooter down to the trap. If there are shooting stalls, they can create their own set of problems as they tend to enclose the shooter. It is possible to design shooting stalls with excellent acoustic and ballistic properties. In any case the ceiling above the stalls should always be covered with high absorbing acoustic materials across ALL frequencies.

Recommended Acoustical Treatment

Rear Wall – it is recommended that the range rear wall be treated with a two-inch (2") soundboard with a density of no less than four-pounds (4lbs) per square foot. The soundboard in order to be effective needs to be backed by a two-inch (2") mineral wool based insulation product with a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf). All materials need to be UL approved as to fire, flame spread and smoke developed. If for some reason you have a laminar flow back wall, you introduce other factors. If you are isolating noise you may want to consider placing acoustic material behind the wall if allowable. A clear laminar flow wall, like a glass wall, should have varying thicknesses of glass or Lexan to help mitigate the noise.

If the rear wall backs up to a control room and/or class rooms it is recommended that before applying acoustic material the wall be covered with one layer of a gypsum board material (drywall) nominal dimension 5/8" thick. This must be installed directly onto the concrete CMU block or AR Steel with NO air space.

All doors should be ballistic and acoustically rated. If there are windows they should be comprised of a single pane ballistic or a dual pane acoustically rated laminated glass.

Side Walls - it is recommended that the side walls be treated with a two-inch (2") soundboard with a density of no less than four-pounds (4lbs) per square foot. The side walls need to be treated from the rear wall to at least seventy-five percent (75%) from the furthestmost firing line to the bullet trap. The soundboard in order to be effective needs to be backed by a minimum of two inches (2") of inorganic mineral wool based insulation product with a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf). All materials need to be UL approved as to fire, flame spread and smoke developed.

Safety Ceiling – the safety ceiling should be treated with one-inch (1") soundboard with a density of no less than two-pounds (2lbs) per square foot. The soundboard needs to be backed by two inches (2") of inorganic mineral wool based insulation product with a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf). All materials need to be UL approved as to fire, flame spread and smoke developed.

Baffles – all baffles except to the one nearest to the bullet trap should be treated with one-inch (1") soundboard with a density of no less than two-pounds (2lbs) per square foot. The soundboard needs to be backed by two inches (2") of inorganic mineral wool based insulation product with a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf). All materials need to be UL approved as to fire, flame spread and smoke developed.

Isolation Ceiling - the factors governing the need for a range isolation ceiling are if there is a noise containment issue in the case of a tactical range, or if the range has a fixed firing line and not-complete down range baffle coverage. An isolation ceiling can be attached to the roof deck or hung. It should consist of one-inch (1") soundboard with a density of no less than two-pounds (2lbs) per square foot. The soundboard needs to be backed by six inches (6") of inorganic mineral wool based insulation product with a nominal density of no less than two and one-half pounds per cubic foot (2.5 pcf). All materials need to be UL approved as to fire, flame spread and smoke developed.

The Troy Solution

Troy Acoustics' patented solution to treat a shooting range is to use high density soundboard that is a mixture of Portland cement and woven wood fibers, bonded together, and that have a material density of equal or greater than two-pounds per square foot (2lbs/sq. ft.) for a one-inch (1") board, and a density of equal or greater than four-pounds per square foot (4lbs/sq. ft.) for a two-inch (2") board.

Troy treats the sidewalls, from the rear wall to the target line with their two-inch (2") Troy Board™ mounted over their two-inch (2") Troy Wool™. Troy Wool™ is a basalt based mineral wool with a nominal density of two-and-one-half pounds per cubic foot (2.5 pcf). The safety ceiling and baffles are treated with one-inch (1") Troy Board™ mounted over two-inches (2") of Troy Wool™. In the case of a fixed-point firing line Troy installs a hung, isolation ceiling that runs from the end of the safety ceiling to the trap that consists of one-inch (1") Troy Board™ topped with six-inches (6") of Troy Wool™.

The key to the Troy design is the full coverage of the range surface areas and high density materials that are proven capable of maintaining their acoustical properties when exposed to intense sound pressures found on a shooting range.

Troy custom engineers every installation to be cost effective while delivering optimum sound absorption and noise abatement.

Comparisons of Acoustically Treated and Un-treated Shooting Ranges

Chart 3 below shows a Reverberation Time (RT60) of 5.39 seconds in all octave bands from 50 Hz to 20,000 Hz before treatment of the Ft Lewis, WA shooting range with the Troy System™, and a Reverb Time (RT60) of 1.08 seconds in all octave bands from 50 Hz to 20,000 Hz after treatment of the Ft Lewis, WA shooting range. The Reverberation Time (RT60) was arrived at by averaging shooter positions in lane 7 firing a single shot M4, at the 7, 25, and 50 meter lines, respectively along with fixed positions in the center of the range at the 25 meter point.

Chart 4

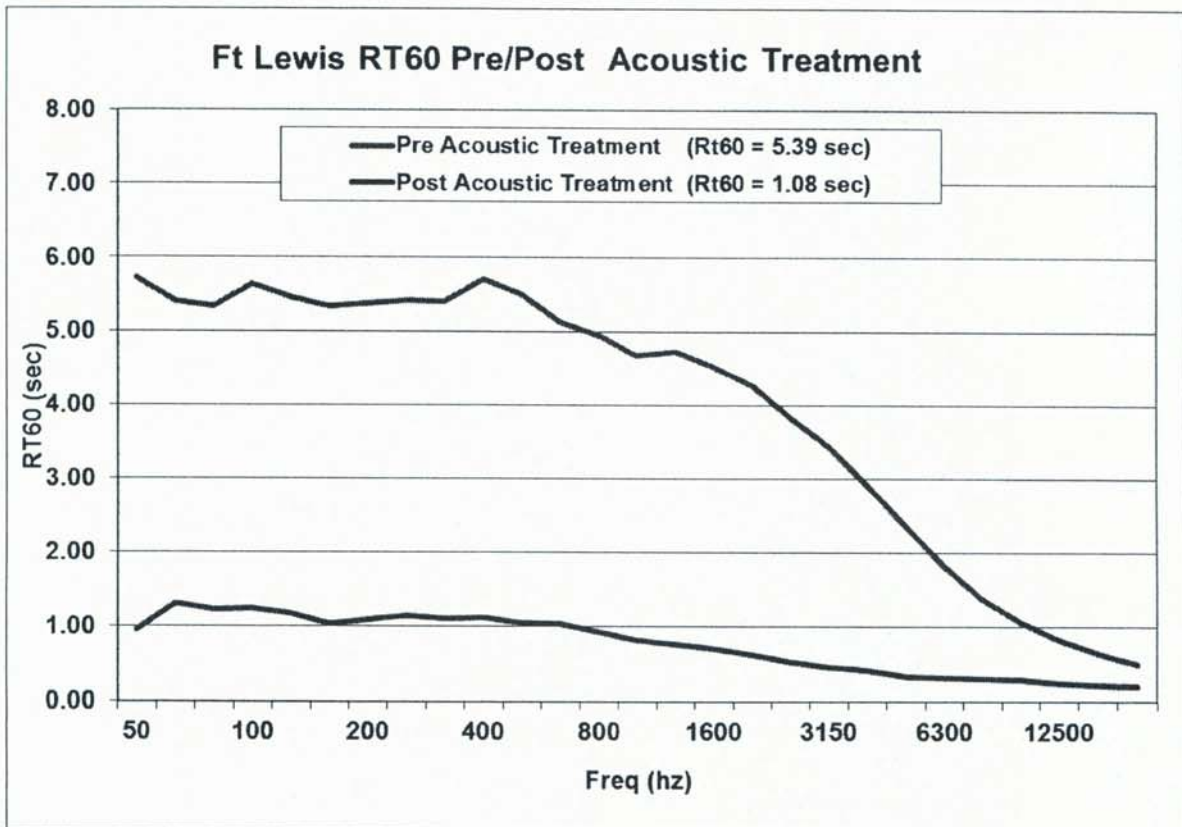
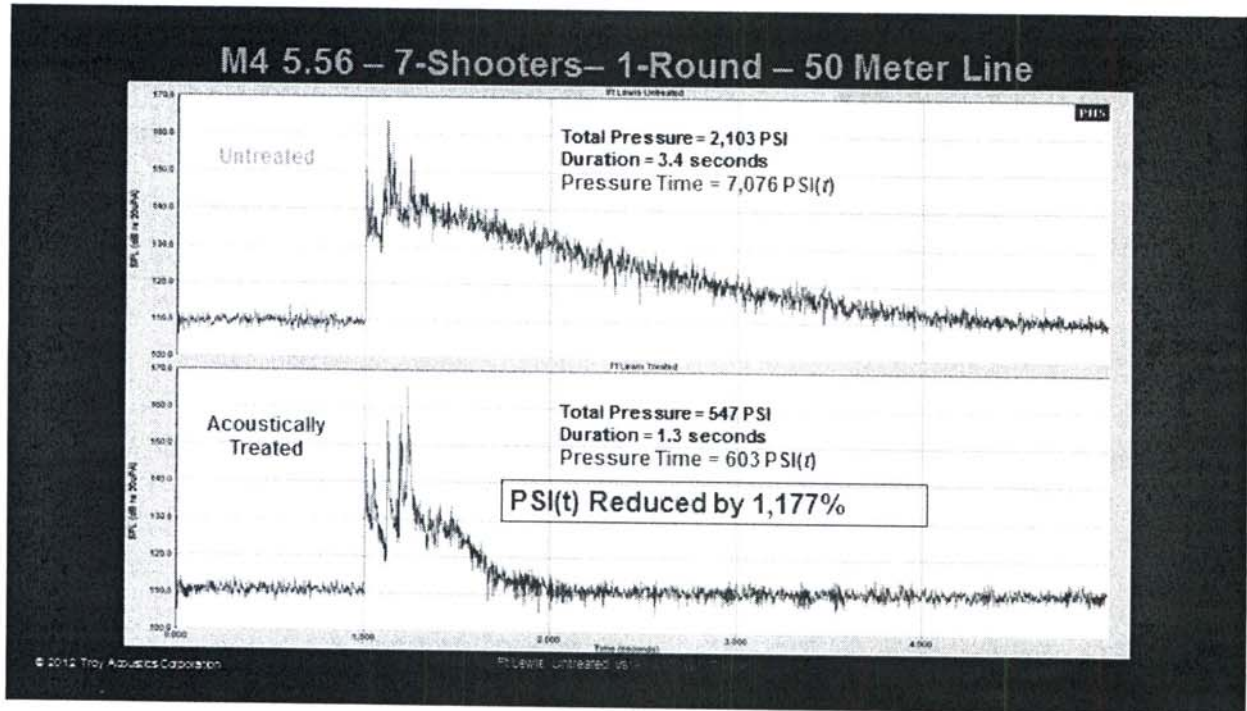


Figure 6 below shows seven (7) shooters, standing in lanes, 1, 3, 5, 7, 9, 11, 13 firing a single round on a M4 – 5.56 from the 50 meter line at Ft Lewis, WA. Psi(t) was reduced from 7,076 psi(t) to 603 psi(t), an improvement of 1,177 percent (%). The total pressure in psi was reduced from 2,103 psi to 543 psi. The shooters exposure time was reduced from 3.4 seconds to 1.3 seconds. The reduction in total pressure is demonstrably apparent and follows the reduction in reverberation (RT60).

Figure 6



Small Ranges Are Particularly Susceptible To Noise Issues

Chart 4 - below shows a Reverberation Time (RT60) of 2.54 seconds in all octave bands from 50 Hz to 20,000 Hz before acoustic treatment of the San Diego Sheriff's Department Vista Range, Vista, CA shooting range, and a **Reverb Time (RT60) of 0.69** seconds in all octave bands from 50 Hz to 20,000 Hz after treatment.

The range is located in the basement of a court house. The range dimensions are 25 feet wide and 100 feet deep.

Chart 4

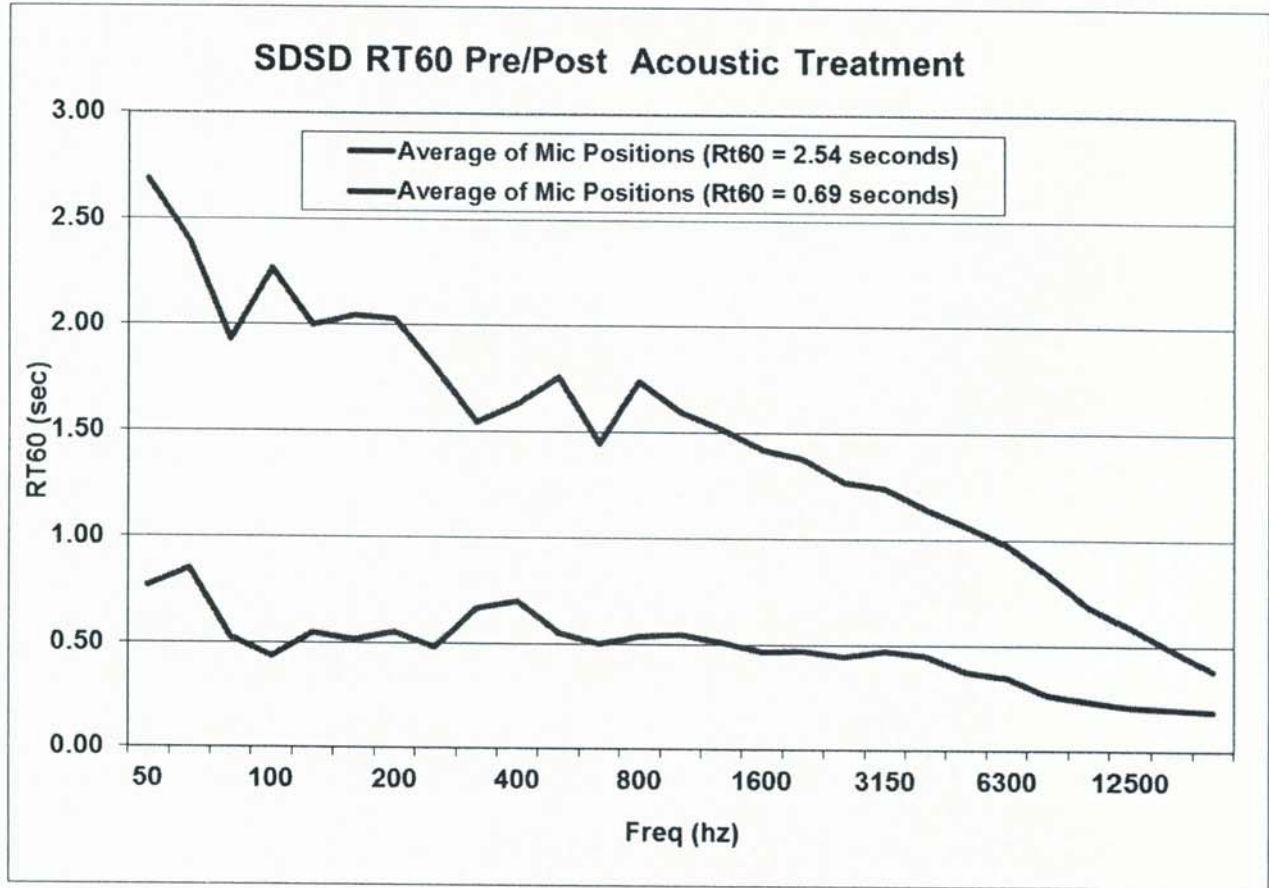


Figure 7 below shows one (1) shooter, standing in lane 3 firing a single round on a M4 – 5.56 from the 25 yard line of the San Diego Sheriff’s Department Vista Range, Vista, CA. Psi(t) was reduced from 733 psi(t) to 28 psi(t), an improvement of 2,623 percent (%) after acoustic treatment. The total pressure in psi was reduced from 690 psi to 93 psi. The shooters exposure time was reduced from 1.06 seconds to 0.3 seconds.

Figure 7

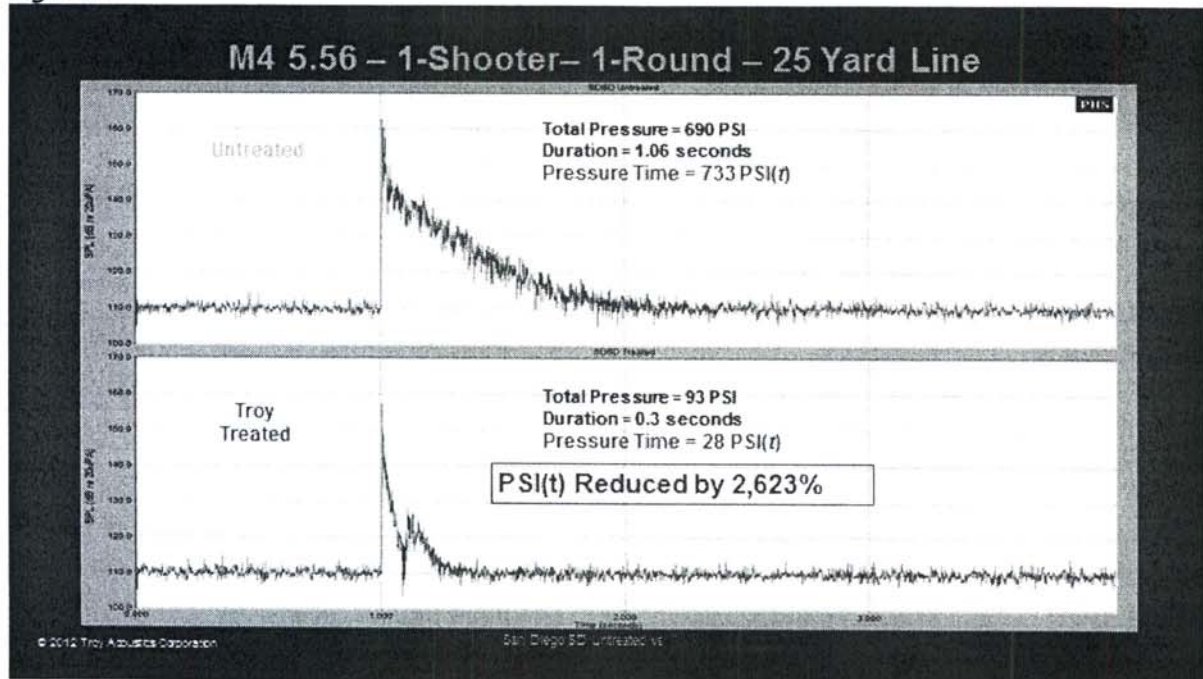
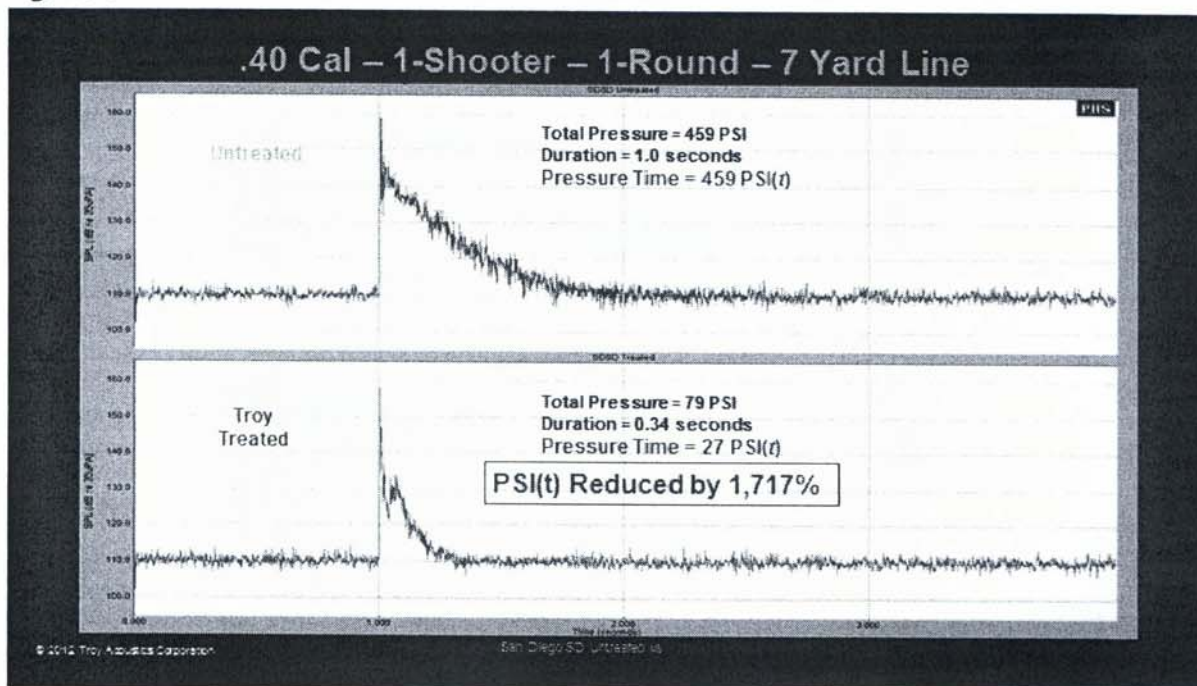


Figure 8 below shows one (1) shooter, standing in lane 3 firing a single round on a .40 caliber pistol from the 7 yard line. Psi(t) was reduced from 459 psi(t) to 27 psi(t), an improvement of 1,717 percent (%). The total pressure in psi was reduced from 459 psi to 79 psi. The shooters exposure time was reduced from 1.0 seconds to 0.34 seconds.

Figure 8



Conclusion

It is totally possible with the selection and proper use of acoustic materials capable of handling the intensely loud noise as found on indoor ranges to reduce the sound to safe levels that will insure full hours of range operation.

It is strongly recommended that you state acoustical performance and acoustical materials specifications in your design and on all bids.

At a minimum include:

- Must be tested to meet 1.3 seconds reverb or less at all positions within the range space, in all octave bands from 125 to 8000 Hz as measured with multiple microphones in multiple positions throughout the range
- That all acoustical products have NRC values of 0.85 or higher based on tests at third-octave band frequencies from 125 to 4,000 hertz (Hz)
- That all acoustic products used are guaranteed by the manufacturer to maintain their absorption values at sound intensities that exceed 160 dB
- That all soundboard used have a minimum density of not less than two-pounds (2 lbs.) per square-foot per one-inch (1") of board.

Troy Acoustics Corporation

- That all insulation products be of an inorganic mineral wool type with a nominal density of no less than 2.5 pcf (40 kg/m³)
- That the installed acoustic system be tested and guaranteed to allow bullets to penetrate or pass without ricochet or splash back, and without noticeable deformation of the system
- Must be tested upon completion to assure compliance with any local noise ordinance criteria (if applicable)
- That all materials selected are UL approved for fire to equal; Flame Spread-0, Smoke Developed-0.
- The final results be **warrantied** and **guaranteed** to meet all specifications

Your Next Step

Contact Troy Acoustics, the only company that specializes in engineering noise control for shooting ranges and that offers the industry's only guaranteed solution. Troy guarantees that Troy materials and the installed Troy System™ will meet all the specifications as listed above. Troy Acoustics engineers shooting range sound absorption, and noise abatement systems, to your exact requirements, and specifications, at a price you can afford. All our work is Guaranteed to meet all, OSHA, government, military, and civilian noise standards, regulations, and ordinances.

Summary

Properly treating an indoor and outdoor shooting range makes not only good health sense but good business sense. It allows the owner to get maxim utilization and return on the investment while protecting personnel from lifelong bodily harm.

The cost-to-benefits from avoiding potential lawsuits and disability claims will more than outweigh any initial investment.

For military and law enforcement ranges effective acoustic treatment means that your people can train longer and harder without fear of physiological effects.

For commercial and private ranges this can mean more customers that stay longer, buy more ammunition, and bring their whole family.

For all, proper acoustic treatment of indoor shooting ranges means good relations with all neighbors and being an integral and important part of the community.

Firearm's training in a safe, healthy environment is essential as to the protection of our country and communities, and to a recreational sport that is enjoyed by all.

Biographical Information

Stephen Katz

This primer was written by Stephen Katz, Vice President Applied Research & Technology, Troy Acoustics. Mr. Katz's experience and qualifications include:

Director, Research and Technology, Troy Acoustics

...Won an Academy Award for the co-development of Dolby Stereo. He has over thirty feature film credits including, *Star Wars*, *Close Encounters of the Third Kind*, and *Altered States*.

...He was a recording engineer for Jimi Hendrix, Chuck Berry, Ike and Tina Turner, Barry Manilow, the St. Louis Symphony, etc.

...Designed and built recording studios for Dolly Parton and Porter Wagner, Pete Drake, the original Cherokee Ranch (Steely Dan, *ajá*), Tom T. Hall, Sea Saint Recording (Allen Toussaint), Grand Funk Railroad, etc.

...Founding partner Eventide Electronics, one of the first manufacturers of professional digital audio equipment including digital delay lines, auto-locators, and pitch changers. Eventides' first project was to design a 2.5 second digital delay line for NASA to be used for astronaut training in preparation for the first moon landing.

Mr. Katz is the Director of the Center for Entertainment Industry Data and Research (CEIDR).

Has authored, been featured, and published reports, papers and articles. His research has been covered by CNN, The New York Times, NPR, The Wall Street Journal to name a few. Mr. Katz was invited by the Harvard Club to debate a former Prime Minister of Canada.

Member: Acoustical Society of America (ASA), Audio Engineering Society (AES), Society of Motion Picture and Television Engineers (SMPTE).

ATTACHMENT 17

**NOTICE OF PUBLIC HEARING
To Consider Modification/Revocation of
Conditional Use Permit CUP2011-05**

NOTICE IS HEREBY GIVEN that on Monday, **February 25, 2013, at 6:00 p.m.**, a public hearing will be conducted in the Council Chamber of the Clovis Civic Center, 1033 Fifth Street, Clovis, CA 93612. The Clovis Planning Commission will consider:

Modification/revocation of Conditional Use Permit CUP2011-05 for "The Firing Line," a firearms shooting range with ancillary rental and sales of firearms equipment in an existing industrial building located at 1173 Dayton Avenue. Matthew and Janet Gross, property owners; Jacob Belemjian, business operator.

All interested parties are invited to comment in writing to the Planning Division by no later than 3:00 p.m. on **February 22, 2013**, and/or to appear at the hearing described above to present testimony in regard to the above listed request. Questions regarding this item should be directed to Dwight Kroll, Director of Planning and Development Services (559) 324-2340.

If you would like to view the Planning Commission Agenda and Staff Reports, please visit the City of Clovis Website at www.cityofclovis.com. Select "Government/Public Documents" and then either "Planning Commission Agenda" or "Planning Commission Reports."

If you challenge a project in court, you may be limited to raising only those issues you or someone else raised at the public hearing described in this notice, or in written correspondence delivered to the City at, or prior to, the public hearing.

David E. Fey, AICP, Deputy City Planner
PUBLISH: Thursday, February 14, 2013 Fresno Bee

ATTACHMENT 18

ATTACHMENT 3
CUP MODIFICATION/ REVOCATION
HEARING PROCEDURES

PLANNING COMMISSION

1. REVIEW PROCEDURES FOR THE GENERAL PUBLIC.
2. CALL HEARING TO ORDER.
3. PROVIDE OATH TO WITNESSES.
 - Have all witnesses who will be testifying on behalf of the City or owner agree to tell the truth under oath.
 - The public who will be providing general comments need not stand and take the oath.
 - The Commission will let the witnesses know that they will be testifying under oath and by doing such they will be agreeing to tell the truth.

Have the witnesses raise their right hand. Read the following statement and obtain their acknowledgment as follows:

“Do you agree to tell the truth and that the testimony you provide tonight will be the whole truth?”

4. CITY PRESENTS ITS CASE.
 - Staff will present the City’s case by referring to staff reports, documentary evidence and calling witnesses.
 - The Commission will then ask questions of City staff and witnesses.
 - The Commission will allow the business owner or the owner’s representative to either ask questions directly of the City witnesses or submit questions to be asked of witnesses to the Planning Commission. This is not a court of law and the Commission need not allow full blown cross-examination which would make the proceedings lengthy and complicated.
5. HEAR ANY GENERAL PUBLIC COMMENT IN SUPPORT OF PROPOSED MODIFICATION/ REVOCATION.
6. OWNER PRESENTS ITS DEFENSE.
 - The owner will present his case by referring to documentary evidence and calling witnesses.

- The Commission will then ask questions of the owner's witnesses.
 - The Commission will allow City staff or the City's representative to either ask questions directly of the owner's witnesses or submit questions to be asked of witnesses to the Planning Commission. This is not a court of law and the Commission need not allow full blown cross-examination which would make the proceedings lengthy and complicated.
7. HEAR ANY GENERAL PUBLIC COMMENT IN OPPOSITION TO PROPOSED MODIFICATION/ REVOCATION.
 8. HEAR CLOSING COMMENTS FROM THE CITY AND OWNER.
 9. ALLOW FOR ANY FINAL PUBLIC COMMENTS.
 10. ADDRESS FOLLOW UP QUESTIONS FROM THE COMMISSION
 11. CLOSE HEARING.
 12. DELIBERATE.
 13. ISSUE FINDINGS AND A RECOMMENDED DECISION.
- Either party may submit proposed findings prior to the hearing.

CITY COUNCIL

1. REVIEW PROCEDURES FOR THE GENERAL PUBLIC.
2. CONSIDER RECOMMENDATION FROM PLANNING COMMISSION.
3. CONSIDER ENTIRE RECORD OF PROCEEDINGS BEFORE PLANNING COMMISSION.
 - Staff will provide a report of the Planning Commission proceedings.
 - Council will allow the owner an opportunity to comment.
 - Council will ask questions of City staff and the owner.
4. COUNCIL WILL EVALUATE WHETHER ADDITIONAL EVIDENCE OR WITNESS TESTIMONY WILL BE ALLOWED.
 - Evaluate requests by City staff or the owner.

- If new evidence or additional witness testimony will be allowed, reopen the hearing and follow the Planning Commission procedures for consideration of that evidence.
5. ALLOW GENERAL PUBLIC COMMENT.
 6. CLOSE HEARING/CONCLUDE PROCEEDINGS.
 7. DELIBERATE.
 8. ISSUE FINDINGS AND A FINAL DECISION.
- Either party may submit proposed findings prior to the Council meeting.

ATTACHMENT 19

***ALTERNATIVE RESOLUTION A
MODIFICATION***

Resolution 12-____

A Resolution of the Planning Commission of the City of Clovis Finding that The Firing Line Has Violated the Conditions of Approval for CUP2011-05 or is Otherwise Operating as a Public Nuisance, and Recommending that the CUP be Modified to include Additional Conditions of Approval

Whereas, on November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue known as The Firing Line (“Range”), business owner Jacob Belemjian (“Owner”), property owner Matthew Gross; and

Whereas, the City Council imposed the following conditions of approval on CUP2011-05, in addition to others:

- Condition 2: Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. Monday through Friday, and 9:00 a.m. to 8:00 p.m. on Saturday and Sunday. (As amended during Council meeting)
- Condition 6: Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses.
- Condition 7: Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit.
- Condition 11: The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap. (As added during Council meeting.)

Whereas, the City Council imposed these conditions for the purpose of ensuring that the Range did not create unwarranted noise or otherwise operate as a nuisance to the residential neighborhood north of and adjacent to the Range; and

Whereas, with the imposition of the conditions of approval, the Council was able to find that the Range “will have no adverse effect on abutting properties and the permitted use thereon;” and

Whereas, the owner was fully aware of the preexisting residential neighborhood and concerns from the neighborhood about noise coming from the Range before obtaining the CUP and before making improvements to the Property: and

Whereas, shortly after opening for business in March 2012, the City received a number of noise complaints from the neighborhood about the Range; and

Whereas, despite the noise complaints and meetings among the City, the neighbors and the owner to resolve those complaints, no significant changes have occurred and the neighbors continue to express concern with the noise; and

Whereas, because of those noise complaints, on February 4, 2013, the City Council scheduled a CUP modification/revocation hearing before the Planning Commission for February 25, 2013, to review CUP2011-05 and to determine whether the Range is in violation of the conditions of approval or is otherwise operating as a nuisance, and if so to consider recommendations for modification of the conditions of approval or for revoking the CUP if modified conditions would not alleviate the violations; and

Whereas, the City properly noticed a CUP modification/revocation hearing for a February 25, 2013, special Planning Commission meeting as reflected in the Planning Commission staff report ("PC Staff report"); and

Whereas, copies of the PC Staff Report were made available to the Owner and neighbors two weeks before the February 25, 2013 hearing, on February 11, 2013; and

Whereas, the PC Staff report reflects the nature of the neighborhood noise complaints, which include concerns with the type and character of noise emitted from firearms used at the Range as well as impacts that the noise has had on the neighbors health and well being and the use and enjoyment of their property, and

Whereas, the Planning Commission held a public hearing on February 25, 2013, to review CUP2011-05; and

Whereas, the Planning Commission received documentary evidence, testimony from the neighbors and the owner, and other testimony and public comment on the matter; and

Whereas, the Planning Commission considered the entire record of proceedings before it, including the PC Staff report, staff and consultant comments, all documentary evidence, testimony, and public comment on the matter.

NOW, THEREFORE, THE PLANNING COMMISSION RESOLVES AS FOLLOWS:

1. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is in violation of CUP2011-05 Condition No.7, Excessive Noise and the Finding for Approval of No Adverse Effect upon Abutting Properties.

This finding is based upon the following:

a. Firearms noise emits an impulsive type of noise with unique sound patterns and frequencies that travel into the residential neighborhood. (PC Staff Report and Attachments 8, 9, 11, 12, 13, 14, 15, 16, staff and consultant comments, public testimony and comment.)

b. Neighbors testified that this impulsive noise from firearms use contains the following characteristics: Constant popping and occasional boom; like a small cannon; very disturbing; explosive concussion sound; sharp, loud and distinctive. (PC Staff Report, public testimony and comment.)

c. Neighbors testified that the noise has had the following impacts upon them: Children are scared and will not go outside to play; unable to distinguish between range gunfire and other gunfire; unable to sleep during the day; have to keep windows closed; cannot enjoy backyard; dogs are scared and agitated and will not go outside; headaches; affects post traumatic stress syndrome; mental degradation; increased stress. (PC Staff Report, public testimony and comment.)

2. Finds, based upon the entire record of the proceedings, that to date Owner has failed to comply with CUP2011-05 Condition No. 11, Compliance With NRA Range Source Book.

This finding is based upon the following:

a. The NRA Source Book reflects a fundamental tenet of properly designing and maintaining shooting ranges so they have no adverse impacts on nearby neighborhoods. The gist of the NRA Source Book is to be a good neighbor with no significant impacts on area residents. This is especially applicable to the situation here, where there was a preexisting residential neighborhood directly behind the Range. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

b. The Owner has failed to take measures to significantly reduce the sound level emanating from the Range. Until measures are taken to significantly reduce the sound levels where the Range will be compatible with the neighborhood, the Owner is in violation of Condition No. 11. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

3. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is causing a public nuisance.

This finding is based upon the following:

a. A large number of neighbors presented testimony of the impacts the Range has had on them. Those impacts include the following:

- Children are scared and will not go outside to play.
- Unable to distinguish between range gunfire and other gunfire.
- Unable to sleep during the day.
- Constant gun-fire seven days a week, so never have any peace and quiet.
- Have to keep windows closed.
- Difficulty sleeping and studying.
- Moved to Clovis to be away from gun-fire previously heard in prior neighborhood.
- Property values are lower.
- Children will become desensitized to gunfire.
- Can't enjoy backyard.
- Dogs are scared, agitated.
- Dogs won't go outside.
- Dogs bark and cause chain reaction in the neighborhood.
- Had to get rid of dogs.
- Windows rattle.
- Headaches.
- Affects post traumatic stress syndrome.
- Mental degradation.
- Anxiety.
- Depression.
- High blood pressure.
- Increased stress.

(PC Staff Report and public testimony and comment.)

b. The City of Clovis noise nuisance standard, contained in Clovis Municipal Code, section 5.8.15 prohibits any person from making noise which is “physically annoying to persons, or which are so harsh or so prolonged or unnatural or unusual in their use, time, and place as to occasion physical discomfort, or which are injurious to the lives, health, peace, and comfort of the inhabitants of the City, or any number thereof.” Any violation of the Municipal Code is also deemed a public nuisance. (CMC § 1.2.01(e).)

c. California Civil Code section 3480 defines a public nuisance as “one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.” A nuisance means: anything “which is injurious to health” or “is indecent or offensive to the senses” so “as to interfere with the comfortable enjoyment of life or property”.

d. A large number of the families north of The Firing Line have had their health and well being adversely impacted by The Firing Range as well as the use and enjoyment of their property. This constitutes a nuisance under both the CMC and Civil Code. (PC Staff Report, public testimony and comment.)

4. Recommends that the City Council add the following new Condition of approval to CUP2011-05, and finds that with the addition of this condition of approval, the Range will no longer be operating in violation of the conditions of approval and will no longer constitute a nuisance.

No impulse noise from firearm use shall exceed a peak of 55dBA (decibels, A weighted) at the residential property line.

This recommendation and finding is based upon the following:

a. Firearm noise at 55 dBA is similar to ordinary industrial noise that could be expected to come from the industrial area south of the neighborhood. (PC Staff Report, staff and consultant comments, consultant presentation, public testimony and comment.)

The foregoing resolution was adopted by the Clovis Planning Commission at a special meeting on February 25, 2013, upon motion by Commissioner _____, seconded by Commissioner _____, and passed by the following vote, to wit:

Ayes:

Noes:

Absent:

Abstain:

PC Resolution 13- _____

Date: _____

Vongsavanh Mouanoutoua, Chair

Attest: _____
David E. Fey, Secretary

ATTACHMENT 20

**ALTERNATIVE RESOLUTION B
REVOCATION**

Resolution 12-____

**A Resolution of the Planning Commission of the City of Clovis Finding that
The Firing Line Has Violated the Conditions of Approval for CUP2011-05 or
is Otherwise Operating as a Public Nuisance, that the Violations Cannot be
Alleviated, and Recommending Revocation of the CUP**

Whereas, on November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue known as The Firing Line (“Range”), business owner Jacob Belemjian (“Owner”), property owner Matthew Gross; and

Whereas, the City Council imposed the following conditions of approval on CUP2011-05, in addition to others:

- Condition 2: Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. Monday through Friday, and 9:00 a.m. to 8:00 p.m. on Saturday and Sunday. (As amended during Council meeting)
- Condition 6: Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses.
- Condition 7: Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit.
- Condition 11: The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap. (As added during Council meeting.)

Whereas, the City Council imposed these conditions for the purpose of ensuring that the Range did not create unwarranted noise or otherwise operate as a nuisance to the residential neighborhood north of and adjacent to the Range; and

Whereas, with the imposition of the conditions of approval, the Council was able to find that the Range “will have no adverse effect on abutting properties and the permitted use thereon;” and

Whereas, the owner was fully aware of the preexisting residential neighborhood and concerns from the neighborhood about noise coming from the Range before obtaining the CUP and before making improvements to the Property: and

Whereas, shortly after opening for business in March 2012, the City received a number of noise complaints from the neighborhood about the Range; and

Whereas, despite the noise complaints and meetings among the City, the neighbors and the owner to resolve those complaints, no significant changes have occurred and the neighbors continue to express concern with the noise; and

Whereas, because of those noise complaints, on February 4, 2013, the City Council scheduled a CUP modification/revocation hearing before the Planning Commission for February 25, 2013, to review CUP2011-05 and to determine whether the Range is in violation of the conditions of approval or is otherwise operating as a nuisance, and if so to consider recommendations for modification of the conditions of approval or for revoking the CUP if modified conditions would not alleviate the violations; and

Whereas, the City properly noticed a CUP modification/revocation hearing for a February 25, 2013, special Planning Commission meeting as reflected in the Planning Commission staff report ("PC Staff report"); and

Whereas, copies of the PC Staff Report were made available to the Owner and neighbors two weeks before the February 25, 2013 hearing, on February 11, 2013; and

Whereas, the PC Staff report reflects the nature of the neighborhood noise complaints, which include concerns with the type and character of noise emitted from firearms used at the Range as well as impacts that the noise has had on the neighbors health and well being and the use and enjoyment of their property, and

Whereas, the Planning Commission held a public hearing on February 25, 2013, to review CUP2011-05; and

Whereas, the Planning Commission received documentary evidence, testimony from the neighbors and the owner, and other testimony and public comment on the matter; and

Whereas, the Planning Commission considered the entire record of proceedings before it, including the PC Staff report, staff and consultant comments, all documentary evidence, testimony, and public comment on the matter.

NOW, THEREFORE, THE PLANNING COMMISSION RESOLVES AS FOLLOWS:

1. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is in violation of CUP2011-05 Condition No.7, Excessive Noise and the Finding for Approval of No Adverse Effect upon Abutting Properties.

This finding is based upon the following:

a. Firearms noise emits an impulsive type of noise with unique sound patterns and frequencies that travel into the residential neighborhood. (PC Staff Report and Attachments 8, 9, 11, 12, 13, 14, 15, 16, staff and consultant comments, public testimony and comment.)

b. Neighbors testified that this impulsive noise from firearms use contains the following characteristics: Constant popping and occasional boom; like a small cannon; very disturbing; explosive concussion sound; sharp, loud and distinctive. (PC Staff Report, public testimony and comment.)

c. Neighbors testified that the noise has had the following impacts upon them: Children are scared and will not go outside to play; unable to distinguish between range gunfire and other gunfire; unable to sleep during the day; have to keep windows closed; cannot enjoy backyard; dogs are scared and agitated and will not go outside; headaches; affects post traumatic stress syndrome; mental degradation; increased stress. (PC Staff Report, public testimony and comment.)

2. Finds, based upon the entire record of the proceedings, that to date Owner has failed to comply with CUP2011-05 Condition No. 11, Compliance With NRA Range Source Book.

This finding is based upon the following:

a. The NRA Source Book reflects a fundamental tenet of properly designing and maintaining shooting ranges so as not to have adverse impacts on nearby neighborhoods. The gist of the NRA Source Book is to be a good neighbor with no significant impacts on area residents. This is especially applicable to the situation here, where there was a preexisting residential neighborhood directly behind the Range. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

b. The Owner has failed to take measures to significantly reduce the sound level emanating from the Range. Until measures are taken to significantly reduce the sound levels where the Range will be compatible with the neighborhood, the Owner is in violation of Condition No. 11. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

3. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is causing a public nuisance.

This finding is based upon the following:

a. A large number of neighbors presented testimony of the impacts the Range has had on them. Those impacts include the following:

- Children are scared and will not go outside to play.
- Unable to distinguish between range gunfire and other gunfire.
- Unable to sleep during the day.
- Constant gun-fire seven days a week, so never have and peace any quiet.
- Have to keep windows closed.
- Difficulty sleeping and studying.
- Moved to Clovis to be away from gun-fire previously heard in prior neighborhood.
- Property values are lower.
- Children will become desensitized to gunfire.
- Can't enjoy backyard.
- Dogs are scared, agitated.
- Dogs won't go outside.
- Dogs bark and cause chain reaction in the neighborhood.
- Had to get rid of dogs.
- Windows rattle.
- Headaches.
- Affects post traumatic stress syndrome.
- Mental degradation.
- Anxiety.
- Depression.
- High blood pressure.
- Increased stress.

(PC Staff Report and public testimony and comment.)

b. The City of Clovis noise nuisance standard, contained in Clovis Municipal Code, section 5.8.15 prohibits any person from making noise which is “physically annoying to persons, or which are so harsh or so prolonged or unnatural or unusual in their use, time, and place as to occasion physical discomfort, or which are injurious to the lives, health, peace, and comfort of the inhabitants of the City, or any number thereof.” Any violation of the Municipal Code is also deemed a public nuisance. (CMC § 1.2.01(e).)

c. California Civil Code section 3480 defines a public nuisance as “one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.” A nuisance means: anything “which is injurious to health” or “is indecent or offensive to the senses” so “as to interfere with the comfortable enjoyment of life or property”.

d. A large number of the families north of The Firing Line have had their health and well being adversely impacted by The Firing Range as well as the use and enjoyment of their property. This constitutes a nuisance under both the CMC and Civil Code. (PC Staff Report, public testimony and comment.)

4. Finds that the violations and nuisance cannot be alleviated with modifications to the CUP, and recommends that the City Council revoke the CUP.

This finding is based upon the following:

a. There are no feasible measures to reduce the noise emitted from firearms use at the Range to a level that will not have an adverse impact upon the neighbors and will not be a nuisance. (Public testimony and comment.)

The foregoing resolution was adopted by the Clovis Planning Commission at a special meeting on February 25, 2013, upon motion by Commissioner _____, seconded by Commissioner _____, and passed by the following vote, to wit:

Ayes:

Noes:

Absent:

Abstain:

PC Resolution 13-_____

Date: _____

Vongsavanh Mouanoutoua, Chair

Attest: _____
David E. Fey, Secretary

ATTACHMENT 21

ALTERNATIVE RESOLUTION C
NO VIOLATION

Resolution 12-____

**A Resolution of the Planning Commission of the City of Clovis Finding that
The Firing Line is in Compliance With the Conditions of Approval for
CUP2011-05 and is Not Operating as a Public Nuisance, and Recommending
That No Action be Taken**

Whereas, on November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue known as The Firing Line (“Range”), business owner Jacob Belemjian (“Owner”), property owner Matthew Gross; and

Whereas, the City Council imposed the following conditions of approval on CUP2011-05, in addition to others:

- Condition 2: Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. Monday through Friday, and 9:00 a.m. to 8:00 p.m. on Saturday and Sunday. (As amended during Council meeting)
- Condition 6: Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses.
- Condition 7: Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit.
- Condition 11: The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap. (As added during Council meeting.)

Whereas, the City Council imposed these conditions for the purpose of ensuring that the Range did not create unwarranted noise or otherwise operate as a nuisance to the residential neighborhood north of and adjacent to the Range; and

Whereas, with the imposition of the conditions of approval, the Council was able to find that the Range “will have no adverse effect on abutting properties and the permitted use thereon;” and

Whereas, the owner was fully aware of the preexisting residential neighborhood and concerns from the neighborhood about noise coming from the Range before obtaining the CUP and before making improvements to the Property; and

Whereas, shortly after opening for business in March 2012, the City received a number of noise complaints from the neighborhood about the Range; and

Whereas, despite the noise complaints and meetings among the City, the neighbors and the owner to resolve those complaints, no significant changes have occurred and the neighbors continue to express concern with the noise; and

Whereas, because of those noise complaints, on February 4, 2013, the City Council scheduled a CUP modification/revocation hearing before the Planning Commission for February 25, 2013, to review CUP2011-05 and to determine whether the Range is in violation of the conditions of approval or is otherwise operating as a nuisance, and if so to consider recommendations for modification of the conditions of approval or for revoking the CUP if modified conditions would not alleviate the violations; and

Whereas, the City properly noticed a CUP modification/revocation hearing for a February 25, 2013, special Planning Commission meeting as reflected in the Planning Commission staff report ("PC Staff report"); and

Whereas, copies of the PC Staff Report were made available to the Owner and neighbors two weeks before the February 25, 2013 hearing, on February 11, 2013; and

Whereas, the PC Staff report reflects the nature of the neighborhood noise complaints, which include concerns with the type and character of noise emitted from firearms used at the Range as well as impacts that the noise has had on the neighbors health and well being and the use and enjoyment of their property, and

Whereas, the Planning Commission held a public hearing on February 25, 2013, to review CUP2011-05; and

Whereas, the Planning Commission received documentary evidence, testimony from the neighbors and the owner, and other testimony and public comment on the matter; and

Whereas, the Planning Commission considered the entire record of proceedings before it, including the PC Staff report, staff and consultant comments, all documentary evidence, testimony, and public comment on the matter.

NOW, THEREFORE, THE PLANNING COMMISSION RESOLVES AS FOLLOWS:

1. Finds, based upon the entire record of the proceedings, that the noise emitted from firearms use at the Range does not exceed the conditions of approval and is not a nuisance.

This finding is based upon the following:

- a. The noise does not exceed the City's General Plan noise standard of 65 CNEL at the residential property, as expressed in CUP Condition No. 6. (PC Staff Report and Attachments 11 and 12, public testimony and comment.)
 - b. The noise is similar to other industrial noise that the neighbors should reasonably have anticipated when they moved into the neighborhood. (Public testimony and comment.)
 - c. The noise does not have any greater adverse impact upon abutting properties than other industrial uses currently existing and allowed in the area. (Public testimony and comment.)
2. Recommends that the City Council take no action on the CUP.

The foregoing resolution was adopted by the Clovis Planning Commission at a special meeting on February 25, 2013, upon motion by Commissioner _____, seconded by Commissioner _____, and passed by the following vote, to wit:

Ayes:

Noes:

Absent:

Abstain:

PC Resolution 13-_____

Date: _____

Vongsavanh Mouanoutoua, Chair

Attest: _____
David E. Fey, Secretary

ATTACHMENT 22

***ALTERNATIVE RESOLUTION D
GENERIC MODIFICATION***

Resolution 12-____

**A Resolution of the Planning Commission of the City of Clovis Finding that
The Firing Line Has Violated the Conditions of Approval for CUP2011-05 or
is Otherwise Operating as a Public Nuisance, and Recommending that the
CUP be Modified to include Additional Conditions of Approval**

Whereas, on November 21, 2011, the City Council approved CUP2011-05 for an indoor shooting range at 1173 Dayton Avenue known as The Firing Line (“Range”), business owner Jacob Belemjian (“Owner”), property owner Matthew Gross; and

Whereas, the City Council imposed the following conditions of approval on CUP2011-05, in addition to others:

- Condition 2: Hours of operation of the firing range shall be limited to 9:00 a.m. to 10:00 p.m. Monday through Friday, and 9:00 a.m. to 8:00 p.m. on Saturday and Sunday. (As amended during Council meeting)
- Condition 6: Operation of the site shall conform with the Clovis General Plan noise standards and not generate any noise in excess of 65 CNEL measured at the residential property line nor in excess of 45 CNEL measured within habitable space of adjacent residential uses.
- Condition 7: Excessive noise, lighting, or vehicular stacking in the circulation lanes shall be considered grounds for revocation of this use permit.
- Condition 11: The interior design and structure of the firing range shall be constructed per the National Rifle Association (NRA) Range Source book, including a 12-foot high concrete wall on the north end, 10-foot high concrete walls on the west and east sides, overhead baffles, and rubber capturing trap. (As added during Council meeting.)

Whereas, the City Council imposed these conditions for the purpose of ensuring that the Range did not create unwarranted noise or otherwise operate as a nuisance to the residential neighborhood north of and adjacent to the Range; and

Whereas, with the imposition of the conditions of approval, the Council was able to find that the Range “will have no adverse effect on abutting properties and the permitted use thereon;” and

Whereas, the owner was fully aware of the preexisting residential neighborhood and concerns from the neighborhood about noise coming from the Range before obtaining the CUP and before making improvements to the Property: and

Whereas, shortly after opening for business in March 2012, the City received a number of noise complaints from the neighborhood about the Range; and

Whereas, despite the noise complaints and meetings among the City, the neighbors and the owner to resolve those complaints, no significant changes have occurred and the neighbors continue to express concern with the noise; and

Whereas, because of those noise complaints, on February 4, 2013, the City Council scheduled a CUP modification/revocation hearing before the Planning Commission for February 25, 2013, to review CUP2011-05 and to determine whether the Range is in violation of the conditions of approval or is otherwise operating as a nuisance, and if so to consider recommendations for modification of the conditions of approval or for revoking the CUP if modified conditions would not alleviate the violations; and

Whereas, the City properly noticed a CUP modification/revocation hearing for a February 25, 2013, special Planning Commission meeting as reflected in the Planning Commission staff report ("PC Staff report"); and

Whereas, copies of the PC Staff Report were made available to the Owner and neighbors two weeks before the February 25, 2013 hearing, on February 11, 2013; and

Whereas, the PC Staff report reflects the nature of the neighborhood noise complaints, which include concerns with the type and character of noise emitted from firearms used at the Range as well as impacts that the noise has had on the neighbors health and well being and the use and enjoyment of their property, and

Whereas, the Planning Commission held a public hearing on February 25, 2013, to review CUP2011-05; and

Whereas, the Planning Commission received documentary evidence, testimony from the neighbors and the owner, and other testimony and public comment on the matter; and

Whereas, the Planning Commission considered the entire record of proceedings before it, including the PC Staff report, staff and consultant comments, all documentary evidence, testimony, and public comment on the matter.

NOW, THEREFORE, THE PLANNING COMMISSION RESOLVES AS FOLLOWS:

1. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is in violation of CUP2011-05 Condition No.7, Excessive Noise and the Finding for Approval of No Adverse Effect upon Abutting Properties.

This finding is based upon the following:

a. Firearms noise emits an impulsive type of noise with unique sound patterns and frequencies that travel into the residential neighborhood. (PC Staff Report and Attachments 8, 9, 11, 12, 13, 14, 15, 16, staff and consultant comments, public testimony and comment.)

b. Neighbors testified that this impulsive noise from firearms use contains the following characteristics: Constant popping and occasional boom; like a small cannon; very disturbing; explosive concussion sound; sharp, loud and distinctive. (PC Staff Report, public testimony and comment.)

c. Neighbors testified that the noise has had the following impacts upon them: Children are scared and will not go outside to play; unable to distinguish between range gunfire and other gunfire; unable to sleep during the day; have to keep windows closed; cannot enjoy backyard; dogs are scared and agitated and will not go outside; headaches; affects post traumatic stress syndrome; mental degradation; increased stress. (PC Staff Report, public testimony and comment.)

2. Finds, based upon the entire record of the proceedings, that to date Owner has failed to comply with CUP2011-05 Condition No. 11, Compliance With NRA Range Source Book.

This finding is based upon the following:

a. The NRA Source Book reflects a fundamental tenet of properly designing and maintaining shooting ranges so as not to have adverse impacts on nearby neighborhoods. The gist of the NRA Source Book is to be a good neighbor with no significant impacts on area residents. This is especially applicable to the situation here, where there was a preexisting residential neighborhood directly behind the Range. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

b. The Owner has failed to take measures to significantly reduce the sound level emanating from the Range. Until measures are taken to significantly reduce the sound levels where the Range will be compatible with the neighborhood, the Owner is in violation of Condition No. 11. (PC Staff Report and Attachment 8, staff comments, public testimony and comment.)

3. Finds, based upon the entire record of the proceedings, that Owner's operation of the Range is causing a public nuisance.

This finding is based upon the following:

a. A large number of neighbors presented testimony of the impacts the Range has had on them. Those impacts include the following:

- Children are scared and will not go outside to play.
- Unable to distinguish between range gunfire and other gunfire.
- Unable to sleep during the day.
- Constant gun-fire seven days a week, so never have any peace and quiet.
- Have to keep windows closed.
- Difficulty sleeping and studying.
- Moved to Clovis to be away from gun-fire previously heard in prior neighborhood.
- Property values are lower.
- Children will become desensitized to gunfire.
- Can't enjoy backyard.
- Dogs are scared, agitated.
- Dogs won't go outside.
- Dogs bark and cause chain reaction in the neighborhood.
- Had to get rid of dogs.
- Windows rattle.
- Headaches.
- Affects post traumatic stress syndrome.
- Mental degradation.
- Anxiety.
- Depression.
- High blood pressure.
- Increased stress.

(PC Staff Report and public testimony and comment.)

b. The City of Clovis noise nuisance standard, contained in Clovis Municipal Code, section 5.8.15 prohibits any person from making noise which is “physically annoying to persons, or which are so harsh or so prolonged or unnatural or unusual in their use, time, and place as to occasion physical discomfort, or which are injurious to the lives, health, peace, and comfort of the inhabitants of the City, or any number thereof.” Any violation of the Municipal Code is also deemed a public nuisance. (CMC § 1.2.01(e).)

c. California Civil Code section 3480 defines a public nuisance as “one which affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal.” A nuisance means: anything “which is injurious to health” or “is indecent or offensive to the senses” so “as to interfere with the comfortable enjoyment of life or property”.

d. A large number of the families north of The Firing Line have had their health and well being adversely impacted by The Firing Range as well as the use and enjoyment of their property. This constitutes a nuisance under both the CMC and Civil Code. (PC Staff Report, public testimony and comment.)

4. Recommends that the City Council add/amend the conditions of approval for CUP2011-05 as follows:

- a.
- b.
- c.
- d.
- e.

5. Finds that with these additions/amendments to the conditions of approval, the Range will no longer be operating in violation of the conditions of approval and will no longer constitute a nuisance.

The recommended additions/amendments to the conditions of approval and this finding are based upon the following:

- a.
- b.
- c.
- d.
- e.

The foregoing resolution was adopted by the Clovis Planning Commission at a special meeting on February 25, 2013, upon motion by Commissioner _____, seconded by Commissioner _____, and passed by the following vote, to wit:

Ayes:

Noes:

Absent:

Abstain:

PC Resolution 13- _____

Date: _____

Vongsavanh Mouanoutoua, Chair

Attest: _____
David E. Fey, Secretary